

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
29 January 2004 (29.01.2004)

PCT

(10) International Publication Number  
**WO 2004/010367 A1**

(51) International Patent Classification<sup>7</sup>: **G06K 5/00**, 13/00

(21) International Application Number:  
PCT/US2003/019790

(22) International Filing Date: 23 June 2003 (23.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
10/205,144 23 July 2002 (23.07.2002) US

(71) Applicant: **CUMMINS-ALLISON CORP.** [US/US];  
891 Feehanville Drive, Mouni Prospect, IL 60056 (US).

(72) Inventors: **JONES, William, J.** 280 Poteet Avenue,  
Barrington, IL 60010 (US); **KLEIN, Robert, J.** #109,  
3201 N. Ravenswood, Chicago, IL 60657 (US); **HAL-  
LOWELL, Curtis, W.**; 1417 E. Reynolds Drive, Palatine,  
IL 60067 (US); **JENRICK, Charles, P.** 3338 N. Paulina  
#2S, Chicago, IL 60657 (US).

(74) Agents: **RUDISILL, Stephen, G.** et al.; Jenkins &  
Gilchrist, Suite 2600, 225 West Washington Street,  
Chicago, IL 60606 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, GR, GU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MY, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,  
SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG,  
UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

#### Declaration under Rule 4.17:

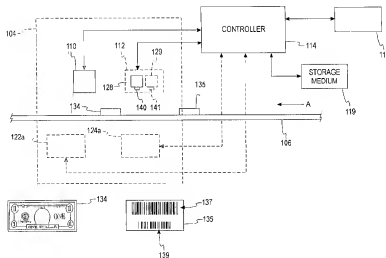
— as to the applicant's entitlement to claim the priority of the  
earlier application (Rule 4.17(iii)) for all designations

#### Published:

— with international search report

[Continued on next page]

(54) Title: SYSTEM AND METHOD FOR PROCESSING CURRENCY BILLS AND DOCUMENTS BEARING BARCODES  
IN A DOCUMENT PROCESSING DEVICE



(57) Abstract: A document processing device having an evaluation region disposed along a transport path between an input and output receptacle capable of processing both currency bills (134) and barcoded media (139) having at least two barcodes (135, 137). One of the barcodes encodes a ticket number and another barcode encodes a payout amount associated with that ticket number. The evaluation region includes detectors for detecting predetermined characteristics of currency bills and a barcode reader for scanning the barcodes printed on the barcoded media. A controller (114) coupled to the evaluation region controls the operation of the document processing device and receives input from and provides information to a user via a control unit. In some embodiments, the document processing device may have any number of output receptacles, and the control unit allows the user to specify which output receptacle receives which type of document.



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**SYSTEM AND METHOD FOR PROCESSING CURRENCY BILLS AND  
DOCUMENTS BEARING BARCODES IN A  
DOCUMENT PROCESSING DEVICE**

**FIELD OF THE INVENTION**

The present invention relates generally to the field of document processing systems and, more particularly, to systems and methods for processing documents bearing barcodes in a document processing device.

5     **BACKGROUND OF THE INVENTION**

Manufacturers of slot machines used in casinos and other gaming establishments are developing coinless redemption slot machines. Lucky winners using these machines receive their payout in the form of a cashout ticket instead of coins or currency bills. The cashout ticket is encoded, typically in the form of a barcode, with a number that is associated with the payout amount. This type of barcoded cashout ticket is assigned a ticket number when it is dispensed to the game player, and this ticket number is printed as a barcode on the face of the ticket. The payout amount is not encoded on the ticket, but rather is stored, typically in a remote database, along with the ticket number. Another form of a cashout ticket includes two barcodes. One of the barcodes represents a ticket number, and another barcode represents the payout amount.

To redeem the payout, the winner may insert the cashout ticket into a validator or acceptor of a slot machine or casino redemption machine which validates the ticket and either dispenses the payout amount in cash or awards the winner a number of credits commensurate with the payout amount. When the casino operators empty the validators, the cartridges may contain a combination of currency bills and cashout tickets.

Most casinos are equipped with currency processing devices which rapidly sort, count, and authenticate currency bills. However, these machines cannot handle or recognize cashout tickets, so the operator must manually hand-sort the currency bills from the cashout tickets so that they can be processed separately. The hand-sorting and manual-entry steps are both time and labor intensive.

Other markets besides the gaming market would benefit from a device that could process both currency and currency substitutes. For example, some retailers are placing self-checkout stations at the point-of-sale. A customer gathers the products to be purchased

and self-scans the products at the self-checkout station without the assistance of a cashier. The customer may pay by credit or debit card or by cash, for example. If paying by cash, the customer typically inserts the currency bills into a bill acceptor or bill validator at the self-checkout station. However, the customer may also desire to redeem store coupons, for  
5 example, at the point-of-sale. To do so, the customer would deposit store coupons into a receptacle at the self-checkout station. The cartridges in the self-checkout station would thus contain both currency bills and store coupons.

When the store operators empty the cartridges, they must hand-sort the store coupons from the currency bills and process the store coupons separately. Again, this hand  
10 sorting and separate processing is tedious and requires multiple counting machines. A single machine that could process both currency bills and store coupons would save time, lower costs, and increase the overall desirability of using self-checkout stations.

#### **SUMMARY OF THE INVENTION**

According to one embodiment of the present invention, there is provided a  
15 document processing device for processing a stack of currency bills and substitute currency media. Substitute currency media include documents which are redeemable for cash, goods, or services. One aspect of the present invention is generally directed to an apparatus having at least two sensors, a currency sensor adapted to scan for at least one characteristic of a currency bill and a media sensor adapted to scan for at least one  
20 characteristic of a substitute currency medium. Another aspect of the present invention is generally directed to an apparatus having a single sensor which is adapted to scan for at least one characteristic of a currency bill and for at least one characteristic of a substitute currency medium.

In a specific aspect of the present invention, the substitute currency media include  
25 barcodes, the media sensor is a barcode reader, and the characteristic is whether a valid barcode is detectable on the substitute currency media. In this specific aspect of the present invention, a transport mechanism transports the currency bills and substitute currency media, one at a time, from an input receptacle to at least one output receptacle. A controller controls the operation of the transport mechanism and the operation of the  
30 sensors. In one embodiment, the apparatus includes one output receptacle only. In other aspects of the present invention, the device includes more than one output receptacle and

a control unit. The operator may specify which of the output receptacles are to receive which type of documents, or different types of documents may be routed to specific output receptacles according to pre-programmed instructions. For example, currency bills may be directed to a first output receptacle and substitute currency media may be directed to a second output receptacle. A memory coupled to the controller may store information about the documents processed, such as the denomination and amounts of currency bills processed, the number of substitute currency media processed, the number of suspect currency bills processed, the value of substitute currency media processed, and so forth.

According to one embodiment of the present invention, there is also provided a method of processing both currency bills and substitute currency media in a single document processing device. A stack of documents including currency bills and substitute currency media are received in an input receptacle. These documents are transported, one at a time, past a currency detector and past a media detector, in any order. The currency detector scans each document for at least one characteristic associated with a currency bill, and the media detector scans each document for at least one characteristic associated with a substitute currency medium. The documents are directed to one or more output receptacles, according to pre-programmed or operator-specified instructions. The device may also generate and display information to the operator via a control unit. The information may include the number of documents processed, the denominations and amounts of currency bills processed, the number of substitute currency media processed, the number of suspect currency bills processed, and so forth.

The above summary of the present invention is not intended to represent each embodiment, or every aspect, of the present invention. Additional features and benefits of the present invention will become apparent from the detailed description, figures, and claims set forth below.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Other objects and advantages of the invention will become apparent upon reading the following detailed description in conjunction with the drawings in which:

FIG. 1a is a functional block diagram of a document processing device according to one embodiment of the invention;

FIG. 1b is a functional block diagram of an evaluation region of a document processing device according to one embodiment of the present invention;

5 FIG. 1c is a functional block diagram of an evaluation region of a document processing device according to another embodiment of the present invention;

FIG. 1d is a top view of a transport path of a document processing device showing a sequence of exemplary documents to be processed;

FIG. 2 is a perspective view of a document processing device according to one  
10 embodiment of the present invention;

FIG. 3 is a front view of a document processing device according to one embodiment of the present invention;

FIG. 4a is a perspective view of an evaluation region according to one embodiment of the document processing device of the present invention;

15 FIG. 4b is a side view of an evaluation region according to one embodiment of the document processing device of the present invention;

FIG. 5 is a perspective view of a compact document processing device having a single output receptacle according to one embodiment of the present invention;

FIG. 6 is a side cross-sectional view of the device shown in FIG. 5;

20 FIG. 7a is a perspective view of a compact document processing device having dual output receptacles according to one embodiment of the present invention;

FIG. 7b is a side cross-sectional view of the device shown in FIG. 7a;

FIG. 8 is a functional block diagram of a document processing device coupled to a coin sorting device according to one embodiment of the present invention;

25 FIG. 9 is a perspective view of a compact coin sorting device according to one embodiment of the present invention;

FIG. 10a is a perspective view of a funds processing machine according to one embodiment of the present invention;

30 FIG. 10b is a side view of the funds processing machine of FIG. 10a which schematically illustrates the various modules present in the funds processing machine;

FIG. 11 is a functional block diagram of a network of document processing devices in communication with a computer network;

FIG. 12 is a flowchart describing the operation of a document processing device according to one embodiment of the present invention;

5 FIG. 13 is a flowchart further describing the operation of a document processing device according to any embodiment described in connection with FIG. 12;

FIG. 13a is a flowchart of a method for operating a document processing device according to any embodiment of the present invention in which the document processing device is adapted to process documents bearing more than one barcode;

10 FIG. 14 illustrates a functional block diagram of a touch/video display according to one embodiment of the present invention;

FIG. 15 is a flowchart of a method for processing documents according to one embodiment of the present invention; and

15 FIG. 16 is a flowchart of a method for processing documents according to another embodiment of the present invention.

#### **DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS**

FIG. 1a is a functional block diagram of a document processing device 100 according to one embodiment of the present invention. The document processing device 100 generally includes an input receptacle 102, an evaluation region 104, a transport mechanism 106, and an output receptacle 108. As explained below, in alternate  
20 embodiments, the device 100 includes more than one output receptacle 108. The output receptacle 108 may also be variously referred to as a reject or offsort pocket or receptacle. Disposed along the transport path 106 is a currency detector 110 and a media detector 112 as functionally illustrated in FIG. 1a. The currency detector 110 and a  
25 control unit 116 are connected to a controller 114, which is adapted to control the operation of the device 100 and to communicate information to and from the control unit 116. For example, the controller 114 may send display information to and receive operator input from the control unit 116. Optionally, the control unit 116 may comprise a touch screen which is coupled to the device 100, or it may comprise a combination of a  
30 desktop computer or laptop, display, and/or keyboard which are coupled to the device

100. An optional printer 120 is shown coupled to the device 100. In an alternate embodiment, the device 100 is not coupled to a printer 120.

In the illustrated embodiment, the device 100 optionally includes a communications port 118 which is coupled to the controller 114. The controller 114 may  
5 comprise one or more processors which are adapted to control specific components in the device 100 and to process information associated with specific components in the device 100, the control unit 116, or the communications port 118. The communications port 118 may optionally be a serial port, a parallel port, a USB port, a wireless port adapted for wireless communication with a remote device, or any other suitable I/O port. In an  
10 alternate embodiment, the device 100 does not include the communications port 118. The controller 114 may further comprise memory, such as random access memory or any other suitable memory.

Although the currency detector 110 is shown to be disposed on one side of the transport path 106, it is understood that the currency detector 110 may instead be  
15 disposed on the opposite side of the transport path 106 only or on both sides of the transport path 106. In the same manner, the media detector 112 may be disposed on the opposite side of the transport path 106 only or on both sides of the transport path 106. These alternate embodiments are described in more detail in connection with FIG. 1b below.

20 In the illustrated embodiment of FIG. 1a, a stack of currency bills and substitute currency media is provided to the input receptacle 102 in any order or in a predetermined order. In one embodiment, the operator provides a mixed combination of currency bills and substitute currency media to the input receptacle 102, which are processed and delivered to one or more output receptacles. In another embodiment, the operator  
25 provides a stack of currency bills only to the input receptacle 102, which are processed and delivered to one or more output receptacles, and then a stack of substitute media only to the input receptacle 102, which are processed and delivered to one or more output receptacles, or vice versa. In this embodiment, the operator may further indicate via the control unit 116 which type of document is to be processed, and the controller 114 may  
30 "deactivate" one or more detectors in the evaluation region 104. For example, if the operator indicates that the type of documents to be processed is currency bills, the



controller 114 may instruct the media detector 112 to ignore the document as it passes along the transport path 106. Alternatively, if the operator indicates that the type of documents to be processed is substitute currency media, the controller 114 may instruct the currency detector 110 to ignore the document as it passes along the transport path 106. Alternatively, the currency detector 110 and the substitute currency media 112 both detect characteristics of the document passing along the transport path, and the control unit 116 may alert the operator of an error condition, such as a substitute currency medium was detected in a stack of currency bills, or a currency bill was detected in a stack of substitute currency media. The operator may set aside the detected document for later processing.

As used herein, a U.S. currency bill refers to U.S. legal tender, such as a \$1, \$2, \$5, \$10, \$20, \$50, or \$100 note, and a foreign currency bill refers to any bank note issued by a non-U.S. governmental agency as legal tender, such as a Euro, Japanese Yen, or British Pound note. A "currency bill" can be either a U.S. or foreign currency bill. The terms "currency note" and "bank note," are synonymous with the term "currency bill."

The term "substitute currency media" refers to redeemable documents. A redeemable document is a document that can be (a) redeemed for cash or (b) exchanged for goods or services or (c) both. Examples of substitute currency media include without limitation: casino cashout tickets (also variously called cashout vouchers or coupons) such as "EZ Pay" tickets issued by International Gaming Technology or "Quicket" tickets issued by Casino Data Systems or CashFree™ slot-machine tickets issued by Slot-Tickets.com; casino script, which is regularly issued by casinos in pre-set denominations such as \$5 casino script, \$20 casino script, for example; promotional media such as Disney Dollars or Toys 'R Us "Geoffrey Dollars" or McDonald's Gift Certificates are also issued in pre-set denominations (e.g., a \$1 Disney Dollar). While some types of "substitute currency media" are regularly issued in pre-set denominations such as the above-mentioned Disney Dollars, other types of "substitute currency media" include manufacturer or retailer coupons, gift certificates, gift cards, or food stamps.

Substitute currency media may include a single barcode or more than one barcode, and these types of substitute currency media are referred to herein as "barcoded tickets." Examples of barcoded tickets 135, 136 include casino cashout tickets such as

“EZ Pay” Tickets and “Quicker” cashout tickets and CashFree™ slot-machine tickets, barcoded retailer coupons, barcoded gift certificates, or any other promotional media that includes a barcode. The singular form of “substitute currency media” is referred to as “substitute currency medium” or “medium” for short.

5 As used herein, a “document” includes a currency bill or a substitute currency medium. Likewise, the term “documents” includes currency bills and/or substitute currency media.

The term “substitute funds” includes casino script, paper tokens, and barcoded tickets. The term substitute currency media encompasses substitute funds, such that the  
10 term substitute funds defines a subset of documents encompassed by the term substitute currency media.

As is known, the dimensions of a U.S. currency bill are about 2.5 inches x 6 inches (6.5 cm x 15.5 cm). All U.S. currency bills have the same dimensions, but in many foreign countries, the dimensions from one denomination to another varies. In  
15 addition, certain types of substitute currency media such as “EZ Pay” tickets have approximately the same dimensions of U.S. currency, however, it is understood that the dimensions of substitute currency media may vary from type to type. The device 100 of the present invention according to any embodiment described herein is adapted to process documents having the same dimension or documents having varied dimensions.

20 Still referring to FIG. 1a, the transport mechanism 106 is adapted to transport the documents, one at a time, through the device 100 in the direction of arrow A, past the currency detector 110 and the media detector 112, and to the output receptacle 108. The currency detector 110 is adapted to detect one or more predetermined characteristics on a currency bill or on a particular kind of substitute currency medium, such as a Disney  
25 Dollar, and the media detector 112 is adapted to detect one or more predetermined characteristics on a particular kind of substitute currency medium, such as a barcode on a barcoded ticket, as explained in more detail in connection with FIG. 1b. The currency detector 110 comprises one or more sensors depending on a number of variables. The variables relate to whether the device 100 is authenticating, counting, or discriminating  
30 denominations of currency bills, and what distinguishing characteristics of the currency bills are being examined, for example, size, thickness, color, magnetism, reflectivity,

absorbability, transmissivity, electrical conductivity, serial number, and so forth. The currency detector 110 may also employ a variety of detection means including, but not limited to, any combination of the following: a size detector, a density sensor, an upper optical scan head, a lower optical scan head, a single or plurality of magnetic sensors, a thread sensor, an infrared sensor, an ultraviolet/fluorescent light scan head, or an image scanner. These detection means and a host of others are disclosed in commonly assigned U.S. Patent No. 6,278,795, entitled "Multi-Pocket Currency Discriminator," which is herein incorporated by reference in its entirety, and co-pending U.S. Patent Application Serial No. 09/965,428, entitled "A Document Processing System Using Full Image Scanning," filed on September 27, 2001, which is herein incorporated by reference in its entirety. Examples of discriminating denomination information from a currency bill are shown and disclosed in commonly assigned U.S. Patent No. 5,815,592, which is herein incorporated by reference in its entirety.

In the specific case of substitute currency media, the variables may also relate to what distinguishing characteristics of the substitute currency media are being examined, such as any combination of the following without limitation: a barcode, a magnetic ink character recognition (MICR) pattern, characters readable by optical character recognition (OCR), including information printed according to the OCR-A and OCR-B fonts, a magnetic pattern, an optical variable device (OVD) pattern such as a hologram, a magnetic or electrically conductive thread, conductive ink, magnetic ink, an electrically conductive polymer, perforations, a coded watermark, or other encoded information. The detection of these distinguishing characteristics may be carried out by the media detector 112, which, in alternate embodiments, may employ a variety of detection means including, but not limited to, any combination of the following: a barcode reader, an optical scan head, a magnetic sensor, a thread sensor, an infrared sensor, an ultraviolet/fluorescent light scan head, an image scanner, or an imaging camera. These detection means and a host of others are disclosed in commonly assigned U.S. Patent No. 6,278,795, entitled "Multi-Pocket Currency Discriminator," previously incorporated by reference, and co-pending U.S. Patent Application Serial No. 09/965,428, entitled "A Document Processing System Using Full Image Scanning," filed on September 27, 2001, also previously incorporated by reference, and may be modified in accordance with the

present invention to detect distinguishing characteristics associated with substitute currency media or to capture an electronic image of one or both sides of a medium.

Some environments, such as a casino environment, may desire to retain copies of processed substitute currency media for record-keeping or other purposes, such as compliance with gaming regulations. In such environments, the media detector 112 includes an imaging camera which captures an electronic image of one or both sides of a passing substitute currency medium and/or a currency bill. The electronic image may be analyzed by software for a barcode pattern, and the barcode pattern may be decoded by software. The use of software to analyze and decode the barcode pattern eliminates the need to include a barcode reader in the media detector 112. After processing, the processed substitute currency medium can be discarded, and the electronic image is stored on one or more storage media, such as hard drives, CD-ROMs, or DVDs, for example. Accordingly, this embodiment eliminates the need for large physical storage space to house the processed substitute currency media. Moreover, the substitute currency media may also be electronically indexed or cross-referenced, simplifying future retrieval and archiving.

In other embodiments, instead of or in addition to an imaging camera, an image scanner is employed to scan one or both sides of a substitute currency medium or currency bill and save the captured images to a storage media under software control.

FIG. 1b shows a functional block diagram of a portion of an evaluation region 104 according to one embodiment of the present invention. The evaluation region 104 generally includes a currency detector 110, a media detector 112, and a controller 114. The evaluation region 104 may optionally include a second currency detector 122a and/or a second media detector 124a which may be disposed on the opposite side of a transport mechanism 106 as shown in FIG. 1b. The currency detector 110 may include any combination of the detection means identified above. In the illustrated embodiment, the media detector 112 comprises a barcode reader 128 and a mirror (not shown). Barcode readers are well known in the art, and will not be described in detail herein. Generally, barcode readers typically use a light beam generated by a laser diode or LED light source 140 to illuminate a barcode label. The laser beam or LED beam is deflected in a certain pattern across the barcode label. The reflected light representing the light and dark bars

on a barcode label are processed and then converted into a digital signal representing the barcode pattern. The digital signal is analyzed by a controller where the signal is decoded into characters (e.g., alphanumerics and/or punctuation).

In one embodiment, the barcode reader 128 is an MS-911 barcode reader  
5 manufactured by Microscan. In alternate embodiments, other barcode readers may be employed, such as, for example, the LM 520, LazerData 8000, LazerData 9000E, or LD12000 barcode readers manufactured by PSC, Inc., the MS-880, MS-7100 or MS-7180 barcode readers manufactured by Microscan, the Maxiscan 2100 or Maxiscan 3300 barcode readers manufactured by Intermec, or an LED barcode reader manufactured by  
10 Welch Allyn. It is understood that the present invention is not limited to any particular barcode reader. The selection of a particular barcode reader depends on a number of factors, including size constraints in the evaluation region 104 of the document processing device, the particular barcode symbology to be scanned, and the desired scan rate. For example, the LazerData 9000E, manufactured by PSC, Inc., has scan rates  
15 ranging from 500 scans per second to 2000 scans per second, and is adapted to scan a linear barcode. The dimensions of the LazerData 9000E are approximately 3.84" (D) x 2.52" (L) x 2.52" (W), or 97.5 mm (D) x 64 mm (L) x 64 mm (W). The MS-911 barcode reader has dimensions of approximately 3" (H) x 2.13" (W) x 1.63" (D), or 75 mm (H) x 53.5 mm (W) x 41 mm (D), and has a scan rate of up to 2000 scans per minute.

20 In alternate embodiments, the barcode reader 128 is adapted to scan at least 500 barcodes per minute, 800 barcodes per minute, 1000 barcodes per minute, 1200 barcodes per minute, and 1500 barcodes per minute.

In the illustrated embodiment shown in FIG. 1b, the controller 114 controls the operation of the barcode reader 128, but in alternate embodiments, a separate barcode  
25 controller (not shown) controls the operation of the barcode reader 128 and is coupled to the controller 114. The controller 114 also controls other operations of the document processing device.

Still referring to FIG. 1b, the media detector 112 optionally includes the barcode reader 128 and the mirror (not shown). The mirror is positioned proximate the barcode  
30 reader 128 to "lengthen" the effective distance between the barcode reader 128 and the document to be scanned, in applications where the barcode reader 128 is placed too close

to the document. As is known, some barcode readers require that they be placed within a range of distance from the scanning surface. If the distance is outside the distance range specifications, the barcode reader cannot obtain reliable and accurate readings. In such applications, the mirror may be positioned to deflect the light beam from the barcode reader 128 onto the document passing along the transport path 106. In alternate  
5 barcode readers in which the barcode reader 128 is positioned within distance range specifications, the mirror is not included.

Still referring to FIG. 1b, a currency bill 134 and a bareoded ticket 136 are shown on the transport mechanism 106. In one embodiment, the barcode encodes characters, such as numbers, which are associated with certain information. For example, on a  
10 casino cashout ticket, the barcode number may be associated with any combination of the following: a payout amount; a ticket number; identification information associated with the slot machine that dispensed the casino cashout ticket, such as, for example, the slot machine number, the time of dispensation, and the amount of payout from the dispensing  
15 slot machine during a time period; identification information associated with the winner of the casino cashout ticket; and so forth. On a gift certificate, the barcode number may be associated with any combination of the following: a gift amount; a gift certificate number; information about a retailer dispensing the gift certificate; terms and conditions information; and so forth. In an alternate embodiment, the barcode encodes a number  
20 which is associated with a certain discount. For example, on a store coupon, the barcode number is typically associated with a promotional discount, such as fifty cents off, or buy one, get one free. The barcode numbers and their corresponding monetary and discount amounts are typically stored in a database. When the barcode number is scanned and identified, the corresponding amount or discount is queried from the database. The  
25 database may also include information indicative of whether a ticket has been redeemed. For example, to prevent fraudulent use of cashout tickets in the casino environment, the database may also keep track of whether a cashout ticket has been redeemed. In yet other embodiments, the barcode may encode any combination of numbers, letters, punctuation, or other characters. It is understood that a barcode in accordance with any embodiment  
30 shown or described herein may encode characters including any combination of numbers, letters, punctuation, or other characters.

Barcodes are well known in the art, and there are numerous barcode symbologies, such as, for example, Codabar, Code 3 of 9, Interleaved 2 of 5, UPC, EAN 8, EAN 13, Postnet, Planet Code, Aztec Code, Code 11, Code 16K, Code 49, Code 93, Code 128, Data Matrix, MaxiCode, 3D or bumpy barcode, to name just a few. These and other  
5 barcode symbologies encode characters such as numbers, letters, and/or punctuation. Barcodes can be linear, like the UPC code, 2-D like the MaxiCode, or 3-D like the bumpy barcode. Barcodes are typically black and white, but they may also be in color. In the illustrated embodiment of FIG. 1b, the barcode reader 128 is capable of scanning a linear barcode. A linear barcode typically comprises a series of parallel dark bars of  
10 varying widths with intervening light spaces, also of varying widths. It is expressly understood that the present invention is not limited to any particular barcode symbology or to any particular barcode reader. In alternate embodiments, multiple barcode readers may be disposed in the evaluation region 104 to identify different barcode symbologies. For example, a retailer may accept both store coupons and gift certificates, but the gift  
15 certificates may be encoded with a different barcode symbology than the store coupons. In such a case, the evaluation region 104 may include two barcode readers, one to identify barcodes disposed on the gift certificates, and one to identify barcodes disposed on the store coupons.

Still referring to FIG. 1b, the currency bill 134 and barcoded ticket 136 are  
20 transported along the transport mechanism 106 in the direction of arrow A. In the illustrated embodiment, the currency bill 134 and barcoded ticket 136 are first transported past the media detector 112 and then past the currency detector 110. However, in an alternate embodiment, a document may be first transported past the currency detector 110 and then past the media detector 112. Alternatively, the barcode  
25 reader 128 and the currency detector 110 may be incorporated into a single component, such as in a scanner that is adapted to scan one or more selected areas of a document or the entire area of a document. In this embodiment, the full image scanner scans for a characteristic associated with a currency bill and for a characteristic associated with a substitute currency medium.

30 As explained previously, the currency detector 110 may comprise one or more sensors disposed at various locations along the transport mechanism 106. In the

alternative embodiment in which the barcode reader 128 is integrated into the currency detector 110, the barcode reader 128 may be positioned among the plurality of sensors at any location within the currency detector 110 and along the transport mechanism 106. Furthermore, as emphasized previously, the currency detector 110 may be disposed on  
5 either side or both sides of the transport mechanism 106.

If the barcode reader 128 does not identify a barcode on the currency bill 134, the barcode reader 128 provides a “no read” electrical signal to the controller 114 indicating that no barcode was read or identified in that scan. As used herein, a substitute currency medium having an unreadable or non-existent barcode may be considered an “invalid”  
10 substitute currency medium. In the illustrated embodiment of FIG. 1b, the transport mechanism 106 transports the currency bill 134 in the direction of arrow A towards the currency detector 110. The currency detector 110 evaluates one or more distinguishing characteristics, such as those specified above, of the currency bill 134. An optional second currency detector 122a disposed on the opposite side of the transport mechanism  
15 106 may also evaluate one or more distinguishing characteristics of the currency bill 134.

In the direction of arrow A shown in FIG. 1b, the next document to be evaluated is the barcoded ticket 136. In FIG. 1b, the barcoded ticket 136 is scanned by the barcode reader 128. If the barcode reader 128 successfully reads the barcode 138 on the barcoded ticket 136, the barcode reader 128 provides a “good read” electrical signal to the  
20 controller 114 indicating that the barcode reader 128 read or identified the barcode 138. As used herein, the term “valid substitute currency medium” refers to a document having a barcode identified by the barcode reader 128. The barcode reader 128 also provides an electrical signal representative of the barcode pattern 138 to the controller 114. The controller 114 decodes this electrical signal into characters, and stores these characters in  
25 memory which may optionally be integrated in the controller 114 or coupled to the controller 114.

In one embodiment, once the barcode reader 128 scans a valid barcode on the barcoded ticket 136, the controller 114 instructs the currency detector 110 to ignore the barcoded ticket 136. In an alternate embodiment, the controller 114 instructs the  
30 currency detector 110 to evaluate the barcoded ticket 136. In this alternate embodiment, if the controller 110 receives a signal from the media detector 124 that it has read a valid



barecode and a signal from the currency detector 110 that it has detected an authentic currency, then the controller 114 provides an error signal to the operator alerting the operator that an unacceptable document has been detected. As used herein, the terms "operator," "user," and "customer" are interchangeable.

- 5 As stated above, the controller 114 may include a memory (not shown). In one embodiment, the memory includes master authenticating information. The master authenticating information includes information about authenticating characteristics of a currency bill, such as size, thickness, color, magnetism, reflectivity, absorbability, transmissivity, electrical conductivity, serial number, and so forth. The memory may
- 10 also include master denomination information. The master denomination information includes information about denomination characteristics of a currency bill. Examples of such characteristics are disclosed in commonly assigned U.S. Patent No. 5,815,592, previously incorporated by reference. In another embodiment, the memory includes media information, which includes information about the substitute currency media.
- 15 This information may include, in alternate embodiments, any combination of the following: an amount of money associated with a medium, a ticket number of a casino cashout ticket, the characters encoded on a barcode on a barcoded medium, self-checkout station identification information, casino gaming machine information, information about the identity of the person redeeming the redeemable document, or the time a medium was
- 20 dispensed, for example. In this embodiment, the media information may be periodically updated in the memory via a computer network coupled to the document processing device 100, such as described in connection with FIG. 11, or the media information may be periodically updated in the memory via personnel, such as retailer or casino personnel. In the latter embodiment, an interface would be provided via the control unit 116 to the
- 25 personnel to reprogram the memory. The memory may be random access memory, flash memory, EEPROM, or any other suitable rewriteable memory.

As explained above, the printer 120 may optionally be coupled to the device 100. When the device 100 is coupled to the printer 120, the printer 120 may print reports containing information about the documents processed by the device 100, such as the

30 reports described in connection with FIGS. 12-13 below. The printer 120 may dispense a redeemable document to an operator of the device 100. For example, as explained

below, an operator may deposit a stack of documents containing a mixed combination of currency bills and substitute currency media into the device 100. The device 100 processes the stack of documents, and, according to one embodiment, dispenses a barcoded ticket whose barcode is associated with the total value of documents processed.

5 For example, an operator may deposit \$134 of currency bills into the device 100 and \$50 worth of redeemable documents. In this example, the device 100 would dispense a barcoded ticket to the operator with a barcode associated with an amount of \$184. In another embodiment, the printer 120 prints both reports and dispenses redeemable documents.

10 FIG. 1c shows an evaluation region 104 which is adapted to process currency bills and substitute currency media bearing more than one barcode. A barcoded ticket 135 includes a first barcode pattern 137 and a second barcode pattern 139 disposed on a surface of the barcoded ticket 135 in the same orientation. Note that the first barcode pattern 137 and the second barcode pattern 139 could be disposed on opposite surfaces of  
15 the barcoded ticket 135 or in different orientations. For example, one or both of the first and second barcode patterns 137, 139 could be disposed in a vertical orientation instead of a horizontal orientation as shown.

In a preferred embodiment, the first barcode pattern 137 and the second barcode pattern 139 are encoded according to the same barcode symbology, though they may also  
20 be encoded according to different barcode symbologies, including any combination of the barcode symbologies mentioned above. Many commercially available barcode readers are capable of discerning among several different barcode symbologies, so the use of different barcode symbologies on a barcoded ticket would not necessarily call for multiple barcode readers. However, if multiple barcode readers are required, additional  
25 readers may be disposed in the media detector 112. An optional second barcode reader 129 is shown in the media detector 112 to scan for barcode patterns on passing documents. Like the barcode reader 128, the optional second barcode reader 129 includes a light source 141 for illuminating the barcode pattern. Barcode readers adapted to detect barcodes such as a bumpy barcode include an additional or alternate detection  
30 structure as is known in the art.

As explained in connection with FIG. 1b, the optional second barcode reader 129 may be disposed in the second media detector 124a on the opposite side of the transport mechanism 106. Such an arrangement would permit detection of a barcode pattern regardless of the facing orientation of the document or would permit detection of a barcode pattern disposed on both sides of a document. In other embodiments, two or more barcode readers may be disposed on each side of the transport mechanism 106.

In embodiments having only one media detector disposed on one side of the transport mechanism 106, the substitute currency media would have to be faced such that the barcode(s) could be detected by the barcode reader 128. This facing may be accomplished manually by the operator before depositing the documents into the document processing device. Alternately, a document facing mechanism coupled to the transport mechanism 106 may be employed to rotate a document 180° so that the face position of the document is reversed. Further details of a document facing mechanism which may be utilized for this purpose are disclosed in commonly assigned U.S. Patent No. 6,074,334, entitled "Document Facing Method and Apparatus," which issued on June 13, 2000, incorporated herein by reference in its entirety. Those skilled in the art will appreciate that the document facing mechanism disclosed in U.S. Patent No. 6,074,334 can be positioned downstream or upstream of the evaluation region 104. In the case where the document facing mechanism is positioned upstream of the evaluation region 104, a suitable detector, such as a barcode reader (not shown), may be disposed upstream of the document facing mechanism to detect the orientation of a substitute currency medium before it is evaluated by the evaluation region 104.

In the case where the document facing mechanism is positioned downstream of the evaluation region 104, the documents are transported past the evaluation region 104 and those documents which are not properly faced are then rotated by the document facing mechanism. Next, the properly faced document is fed back to the evaluation region 104 either along the same transport path or along a different transport path for processing. This embodiment avoids the scenario where an operator must reprocess wrong-way facing documents.

According to some embodiments, the controller 114 shown in FIG. 1c is coupled to the communications port 118 and to a storage medium 119. The storage medium 119

may be a hard drive, a network drive, a floppy disk, a RAM, a CompactFlash card, a database, or any other suitable storage medium. In one embodiment, the controller 114 stores characteristic information associated with the documents being processed in the storage medium 119. In the case of a currency bill, the characteristic information may include information about the size, thickness, color, magnetism, reflectivity, absorptivity, transmissivity, electrical conductivity, or serial number of the currency bill. The characteristic information may also include denomination discrimination information or any other information mentioned herein. In the case of a substitute currency medium, the characteristic information may include a barcode pattern, a magnetic ink character recognition (MICR) pattern, characters readable by optical character recognition (OCR), including information printed according to the OCR-A and OCR-B fonts, a magnetic pattern, an optical variable device (OVD) pattern such as a hologram, a magnetic or electrically conductive thread, conductive ink, magnetic ink, an electrically conductive polymer, perforations, a coded watermark, or other encoded information mentioned herein.

FIG. 1d depicts an exemplary set of documents that might be presented on a portion of the transport mechanism 106. The documents are transported in the direction of arrow A, and, in one embodiment, the first document to be transported is a batch identification card 150 or header card bearing a barcode pattern 152. The barcode pattern 152 disposed on the batch identification card 150 encodes a set of characters that is associated with the machine from which the documents that follow originated. For example, in a casino environment, there might be numerous slot machines, video-poker machines, and redemption machines which need to be emptied periodically and reconciled with the casino's accounting system. To identify from which machine a given batch of documents originated, a batch identification card is placed in the bill validator box of the machine. A number is encoded in the form of a barcode pattern 152 and imprinted or embedded on the batch identification card 150. The card 150 is then placed in the bill validator box such that when the contents of the box is emptied and placed into an input receptacle of a document processing device, the card 150 will be the first document processed by the document processing device. For the sake of example, the

barcode pattern 152 encodes the number 00123, which represents slot machine number 123.

The next documents to be processed are the currency bills and substitute currency media contained in the bill validator boxes of the machine identified by the batch identification card 150. For illustrative purposes only, a few currency bills and substitute currency media are shown in FIG. 1d. In practice, the documents will not necessarily face the same direction or have the same orientation, nor will necessarily they be presented in the order shown. In the example illustrated, a one-dollar bill 154 is the next document to be transported along the transport mechanism 106. The one-dollar bill 154 is followed by a first barcoded ticket 156 that bears two barcode patterns 158, 160. The barcode pattern 158 represents a multidigit ticket number such as 12345 and the barcode pattern 160 represents a value such as \$100. The barcode pattern 160 may include only numbers, such as 10000 to represent \$100.00. Alternately, the barcode pattern 160 may be decoded into a symbol and a decimal number, such as \$100.00 to represent one-hundred dollars or £50.50 to represent fifty pounds and fifty pence. The latter approach permits barcoded tickets to be dispensed in domestic and foreign currency amounts. The barcode pattern 158 may be decoded into a number having a fixed or variable number of digits or into alphanumeric characters and symbols.

The presence of the barcoded ticket 156 on the transport mechanism 106 means that a casino patron received the barcoded ticket 156, perhaps as part of a casino's promotion to entice the casino patron to play a game or perhaps because the patron won \$100 at a gaming machine. Then, the casino patron exchanged the barcoded ticket 156 either for \$100 cash or for game credits at a gaming machine. Thus, barcoded ticket 156 has been redeemed, and needs to be processed so that it can be reconciled with the casino's accounting system.

The next documents transported by the transport mechanism 106 are a second barcoded ticket 162, a twenty-dollar bill 164, and a five-dollar bill 166. Additional documents (not shown) will be transported by the transport mechanism 106 until there are no more documents in the input receptacle to be processed. If another batch identification card is detected, all subsequent documents (until another batch

identification card is detected) will be associated with the batch identification card. In an alternate embodiment, batch identification cards are not used.

Although the documents shown in FIG. 1d have been discussed in connection with a casino environment, the same discussion applies equally to other environments  
5 where other types of documents are used, such as retailer stores where food coupons and gift certificates are used or amusement parks where promotional media are used.

The document processing device 100 shown and described in connection with FIGS. 1a, 1b, and 1c processes documents at a rate equal to or greater than 600 documents per minute. In other embodiments, documents are processed at a rate equal to  
10 or greater than 800 documents per minute. In still other embodiments, documents are processed at a rate equal to or greater than 1000 documents per minute. In yet other embodiments, documents are processed at a rate equal to or greater than 1200 documents per minute. In still other embodiments, documents are processed at a rate equal to or greater than 1500 documents per minute. In yet other embodiments, documents are  
15 processed at a rate less than 600 documents per minute.

The document processing device 100 shown and described in connection with FIGS. 1a, 1b, and 1c represents but one of numerous embodiments into which the evaluation region 104 may be incorporated. It is expressly understood that the document processing device 100 shown and described in connection with FIGS. 1a, 1b, and 1c may  
20 be modified in accordance with numerous other embodiments. For example, as explained next, the device 100 may be modified in accordance with any one or more of the following embodiments:

(1) a multi-pocket document processing device having a plurality of output receptacles and incorporating any embodiment of the evaluation region 104 shown or  
25 described in connection with FIGS. 1a, 1b, and 1c;

(2) a document processing device having a single output receptacle and incorporating any embodiment of the evaluation region 104 shown or described in connection with FIGS. 1a, 1b, and 1c;

(3) a document processing device having dual output receptacles and  
30 incorporating any embodiment of the evaluation region 104 shown or described in connection with FIGS. 1a, 1b, and 1c;

(4) any of the foregoing embodiments (1) - (3) may be coupled to a coin sorting device;

(5) a funds processing device capable of processing both documents and coins and incorporating any embodiment of the evaluation region 104 shown or described in connection with FIGS. 1a, 1b, and 1c;

(6) any of the foregoing embodiments (1) - (5) may be communicatively coupled to a computer network, such as a casino gaming network or a retailer network;

(7) any of the foregoing embodiments (1) - (6) may include a control unit for receiving operator instructions and displaying information to an operator;

(8) a system employing a plurality of document processing devices according to any of the foregoing embodiments (1) - (7); or

(9) a system employing a document processing device according to any of the foregoing embodiments (1) - (7) capable of processing currency bills and barcoded tickets imprinted or embedded with at least two barcode patterns.

#### **Document processing device having multiple output receptacles**

As discussed above, according to some embodiments, the evaluation region 104 shown and described in connection with FIG. 1b is incorporated into a document processing device having multiple output receptacles. In accordance with such embodiments, FIGS. 2 and 3 illustrate several views of a multi-pocket document processing device 200. A stack of currency bills and substitute currency media are provided to an input receptacle 202 in any order or in a predetermined order. The currency bills and substitute media may be facing one orientation or facing mixed orientations. The currency bills and substitute currency media are fed, one by one, into a transport mechanism 206. The transport mechanism 206 transports currency bills and substitute currency media to one of a plurality of output receptacles 208a-208h, which may include upper output receptacles 208a, 208b, as well as lower output receptacles 208c-208h. Before a document reaches an output receptacle 208, the transport mechanism 206 guides it through an evaluation region 204 where a document can be, for example, analyzed, authenticated, denominated, counted, validated, and/or otherwise processed. In alternative embodiments of the device 200, the evaluation region 204 can

determine document orientation, document size, or whether documents are stacked upon one another. The results of the above process or processes may be used to determine to which output receptacle 208 a document is directed. The illustrated embodiment of the document processing device 200 has an overall width,  $W_1$ , of approximately 4.87 feet (1.46 meters), a height,  $H_1$ , of approximately 4.85 feet (1.45 meters), and a depth,  $D_1$ , of approximately 1.67 feet (0.50 meters).

In the illustrated embodiment, interposed in the transport mechanism 206, intermediate the evaluation region 204 and the lower output receptacles 208c-208h, is a document facing mechanism designated generally by reference numeral 203. The document facing mechanism 203 is capable of rotating a document (*i.e.*, a currency bill or substitute currency medium) 180° so that the face position of the document is reversed. That is, if a U.S. currency bill, for example, is initially presented with the surface bearing a portrait of a president facing down, it may be directed to the document facing mechanism 203, whereupon it will be rotated 180° so that the surface with the portrait faces up. The leading edge of the document remains constant while the document is being rotated 180° by the document facing mechanism 203. The decision may be taken to send a document to the document facing mechanism 203 when the selected mode of operation or other operator instructions call for maintaining a given face position of documents as they are processed by the device 200. For example, it may be desirable in certain circumstances for all of the currency bills ultimately delivered to the lower output receptacles 208c-208h to have the currency bill surface bearing the portrait of the president facing up. In such embodiments of the device 200, the evaluation region 204 is capable of determining the face position of a bill, such that a bill not having the desired face position can first be directed to the document facing mechanism 203 before being delivered to the appropriate output receptacle 208. Further details of a document facing mechanism which may be utilized for this purpose are disclosed in commonly assigned U.S. Patent No. 6,074,334, entitled "Document Facing Method and Apparatus," which issued on June 13, 2000, incorporated herein by reference in its entirety, and may be employed in conjunction with the present invention such as the device illustrated in FIGS. 2 and 3. Another document facing mechanism which may be employed in another embodiment is disclosed in commonly assigned, U.S. Patent No. 6,371,303, entitled



“Two Belt Bill Facing Mechanism,” issued on April 16, 2002, which is herein incorporated by reference in its entirety. Alternative embodiments of the device 200 do not include the document facing mechanism 203.

The document processing device 200 in FIG. 2 may be controlled from a separate  
5 control unit 216 which has a display/user-interface 217. In one embodiment of the present invention, the display/user-interface 217 incorporates a touch panel display which displays information including “functional” keys when appropriate. The display/user-interface 217 may be a full graphics display. Alternatively, additional physical keys or buttons, such as a keyboard 219, may be employed. The control unit 216 may be a self-  
10 contained desktop or laptop computer which communicates with the device 200 via a cable 221. In one embodiment, the device 200 includes a suitable communications port (not shown) for this purpose. In another embodiment, the control unit 216 communicates with the device 200 wirelessly via a wireless modem (not shown). In embodiments in which the control unit 216 is a desktop computer wherein the display/user-interface 217  
15 and the desktop computer are physically separable, the desktop computer may be stored within a compartment 225 of the device 200. In other alternative embodiments, the control unit 216 is integrated into the device 200 so that the control unit 216 is contained within the device 200. In this embodiment, the display/user-interface 217 may comprise a touch screen or touch panel display that is coupled to the device 200.

20 The operator can control the operation of the device 200 through the control unit 216. By selecting various user-defined modes through the control unit 216, such as via an input device such as a keyboard 219, or a switch, button, or touch screen (not shown), the operator can direct currency bills and substitute media into specific output receptacles, such as output receptacles 208a-208h. Note that fewer or more output  
25 receptacles may be employed in alternate embodiments. In still other embodiments, the user can select pre-programmed modes or create new user-defined modes based on the particular requirements of the application. For example, the operator may select a user-defined mode which instructs the device 200 to sort currency bills by denomination; accordingly, the evaluation region 204 would denominate the bills and direct one dollar  
30 bills into the first lower output receptacle 208c, five dollar bills into the second lower output receptacle 108d, ten dollar bills into the third lower output receptacle 208e, twenty

dollar bills into the forth lower output receptacle 208f, fifty dollar bills into the fifth lower output receptacle 208g, and one-hundred dollar bills into the sixth lower output receptacle 208h. The operator may also instruct the device 200 to deliver those bills whose denomination was not determined, *i.e.*, no call bills, to the first upper output  
5 receptacle 208a. In such an embodiment, the upper output receptacle 208a would function as a reject pocket. In an alternative embodiment, the operator may instruct the device 200 to also evaluate the authenticity of each currency bill. In such an embodiment, authentic bills would be directed to the appropriate lower output receptacles 208c-208h. Those bills that were determined not to be authentic, *i.e.*, suspect  
10 bills, would be delivered to the second upper output receptacle 208b. A multitude of user defined modes are disclosed in commonly assigned U.S. Patent No. 6,278,795, previously incorporated by reference, which may be employed in conjunction with the present invention such as the device illustrated in FIGS. 2 and 3. According to another embodiment, the device 200 is adapted to process documents according to a strapping  
15 mode of operation as shown and described in co-pending U.S. Patent Application Serial No. 09/635,181, entitled "Method of Creating Identifiable Smaller Stacks of Currency Bills Within a Larger Stack of Currency Bills," which was filed on August 8, 2000, and is incorporated herein by reference in its entirety. According to still another embodiment, the device 200 is adapted to process documents according to a disable-  
20 pockets mode of operation as shown and described in co-pending U.S. Patent Application Serial No. 09/688,538, entitled "Currency Handling System Having Multiple Output Receptacles," which was filed on October 16, 2000 and is incorporated herein by reference in its entirety.

It should be noted that the control unit 216 provides the operator with a broad  
25 range of flexibility in selecting which output receptacles receive which documents. For example, the operator may instruct the device 200 to sort the currency bills by denomination and to deliver authentic currency bills according to their denomination into selected ones of the output receptacles 208c-208h. The operator may further instruct the device 200 to deliver no call bills and suspect bills into output receptacle 208a, and to  
30 deliver substitute currency media into output receptacle 208b. In addition, the device 200 may be unable to evaluate a particular document because, for example, it is damaged or

excessively worn. The operator may instruct the device 200 to deliver any substitute currency media that cannot be evaluated to the output receptacle 108a. Alternatively, additional output receptacles (not shown) may be employed to receive any combination of no call bills, suspect bills, valid substitute currency media, or invalid substitute  
5 currency media. The delivery of such documents may occur without suspension of operation of the device 200, or with suspension of the operation of the device 200, as explained next.

According to some embodiments, the device 200 is configured so that when the evaluation region 204 is unable to identify certain criteria regarding a currency bill or  
10 substitute currency medium, the unidentified document is flagged and "presented" in one of the output receptacles 208a-208h, that is, the transport mechanism 206 is suspended or halted so that the unidentified document is located at a predetermined position within one of the output receptacles 208a-208h, such as being the last document transported to one of the output receptacles. In the case of currency bills, such criteria can include  
15 denominating information, authenticating information, information indicative of the currency bill's series, or other information the evaluation region 204 is attempting to obtain pursuant to a mode of operation. In the case of substitute currency media, such criteria may include, in addition to or exclusive of the criteria mentioned above, whether information, such as a valid barcode, is detected on the substitute currency media.

20 The user may determine in which output receptacle 208a-208h the flagged document is presented according to a selected mode of operation. For example, where the unidentified document is the last document transported to an output receptacle 208a-208h, it may be positioned within a stacker wheel or positioned at the top of the documents already within the output receptacle 208a-208h. While unidentified  
25 documents may be transported to any output receptacles 208a-208h, it may be more convenient for the operator to have unidentified documents transported to one of the upper output receptacles 208a,b, which are positioned such that the operator is able to easily see and/or inspect the document which has not been identified by the evaluation region 204. The operator may then either visually inspect the flagged document while it  
30 is resting on the top of the stack, or the operator may decide to remove the document from the output receptacle 208 in order to examine the flagged document more closely.

In an alternative embodiment of the device 200, the control unit 216 may communicate to the user via the display/user-interface 217 information identifying which one of the output receptacles 108a-108h a flagged document is presented.

The device 200 may be adapted to continue operation automatically when a  
5 flagged document is removed from the upper output receptacle 208a,b or, according to one embodiment of the present invention, the device 200 may be adapted to suspend or halt operation and require input from the operator via the control unit 216. Upon examination of a flagged document by the operator, it may be found that the flagged document is genuine or valid even though it was not identified as such by the evaluation  
10 region 204 or the evaluation region 204 may have been unable to denominate the flagged document. However, because the document was not identified, the total value and/or denomination counters will not reflect its value. According to one embodiment, such an unidentified document is removed from the output receptacles 208 and reprocessed or set aside. According to another embodiment, the flagged documents may accumulate in the  
15 upper output receptacles 208a,b until the batch of documents currently being processed is completed or the output receptacle 208a,b is full and then reprocessed or set aside. In yet another embodiment, the control unit 216 of the device 200 includes denomination keys, such as disclosed in commonly assigned U.S. Patent No. 5,790,697, which is herein incorporated by reference in its entirety. Upon inspection of a flagged currency bill, such  
20 as a no call bill, the operator may manually key in the denomination of the bill via a denomination key, and resume operation. In the case of a substitute currency media, the operator may manually enter into the device 200 via the control unit 216 information about the substitute currency media. Such information may include the barcode number when the substitute currency media is a barcoded ticket, the "denomination" of the  
25 substitute currency media, such as a \$5 Disney Dollar, the value associated with the barcoded ticket, such as \$100, and other identifying information.

According to other embodiments, when a document is flagged, the transport mechanism may be stopped before the flagged document is transported to one of the output receptacles. Such an embodiment is particularly suited for situations in which the  
30 operator need not examine the document being flagged; for example, the device 200 is instructed to first process United States currency and then British currency pursuant to a

selected mode of operation where the device 200 processes United States \$1, \$5, \$10, \$20, \$50, and \$100 currency bills into the lower output receptacles 208e-208h, respectively. Upon detection of the first British pound note, the device 200 may halt operation allowing the operator to empty the lower output receptacles 208c-208h and to  
5 make any spatial adjustments necessary to accommodate the British currency. A multitude of modes of operation which may be employed in conjunction with the present invention are described in conjunction with bill flagging, presenting, and/or transport halting in commonly assigned U.S. Patent Application Serial No. 08/864,423 entitled "Method and Apparatus for Document Processing," which is herein incorporated by  
10 reference in its entirety.

In the illustrated embodiment, with regard to the upper output receptacles 208a and 208b, the second upper output receptacle 208b is provided with a stacker wheel 227 for accumulating a number of documents, while the first upper output receptacle 208a is not provided with such a stacker wheel. Thus, when, pursuant to a preprogrammed mode  
15 of operation or a user-selected mode or other operator instructions, a document is to be fed to the first upper output receptacle 208a, there may be a further instruction to momentarily suspend operation of the device 200 for the operator to inspect and remove the document. On the other hand, it may be possible to allow a number of documents to accumulate in the first upper output receptacle 208a before operation is suspended or  
20 halted. Similarly, the second upper output receptacle 208b may be utilized initially as an additional one of the lower output receptacles 208c-208h. However, in the illustrated embodiment shown in FIG. 2, there is no storage cassette associated with the second upper output receptacle 208b. Therefore, when the second upper output receptacle 208b is full, operation may be suspended to remove the documents at such time as yet further  
25 documents are directed to the second upper output receptacle 208b in accordance with the selected mode of operation or other operator instructions. According to an alternative embodiment of the device 200, both the first and the second upper output receptacles 208a, 208b are equipped with a stacker wheel. According to such an embodiment both the upper output receptacles 208a, 208b may also function as the lower output receptacle  
30 208c-208h, thereby allowing a number of documents to be stacked therein. In yet

another embodiment, the first upper output receptacle 208a and the second upper output receptacle 208b are not provided with a stacker wheel 227.

FIGS. 4a and 4b illustrate the evaluation region 204 according to one embodiment of the device 200. The evaluation region 204 can be opened for service,  
5 access to sensors, to clear document jams, *etc.*, as shown in FIG. 4a. Additional details of the evaluation region 204 are provided with reference to the evaluation region 104 shown and described in FIG. 1b. As previously explained, the evaluation region 204 shown in FIG. 4a may employ any combination of the following detection means without limitation in one or more alternate embodiments: a size detection and density sensor  
10 408, a lower optical scan head 410, an upper optical scan head 412, a single or multitude of magnetic sensors 414, a thread sensor 416, an infrared sensor (not shown), an ultraviolet/fluorescent light scan head 418, an upper media detector 403a, or a lower media detector 403b. As noted in connection with FIG. 1b, these detection means may be disposed in any order and on either or both sides of the transport plate 400 without  
15 departing from the present invention. These detection means and a host of others are disclosed in commonly assigned U.S. Patent No. 6,278,795, entitled "Multi-Pocket Currency Discriminator," previously incorporated by reference, and U.S. Patent Application Serial No. 09/965,428, entitled "A Document Processing System Using Full Image Scanning," filed on September 27, 2001, also previously incorporated by  
20 reference. As noted above, in the specific case of substitute currency media, the variables may also relate to what distinguishing characteristics of the substitute currency media are being examined, such as any combination of the following without limitation: a barcode, a MICR pattern, OCR-readable information, including information printed according to the OCR-A and OCR-B fonts, a magnetic pattern, an OVD pattern such as a  
25 hologram, a magnetic thread or an electrically conductive thread, conductive ink, or an electrically conductive polymer.

The direction of document travel through the evaluation region 204 is indicated by arrow A in FIG. 4a. The documents (*i.e.*, currency bills and/or substitute currency media) are positively driven along a transport plate 400 through the evaluation region  
30 204 by means of a transport roll arrangement comprising both driven rollers 402 and passive rollers 404. The rollers 402 are driven by a motor (not shown) via a belt 401.

Passive rollers 404 are mounted in such a manner as to be freewheeling about their respective axis and biased into counter-rotating contact with the corresponding driven rollers 402. The driven and passive rollers 402, 404 are mounted so that they are substantially coplanar with the transport plate 400. The transport roll arrangement also  
5 includes compressible rollers 406 to aid in maintaining the documents flat against the transport plate 400. Maintaining the document flat against the transport plate 400 so that the document lies flat when transported past the sensors enhances the overall reliability of the evaluation processes. A similar transport arrangement is disclosed in commonly-owned United States Patent No. 5,687,963, entitled "Method and Apparatus for  
10 Discriminating and Counting Documents," which is incorporated herein by reference in its entirety.

Additional details concerning the input receptacle 202, transport mechanism 206, and diverters 237 are disclosed in commonly assigned U.S. Patent Number 6,398,000, entitled "Currency Handling System Having Multiple Output Receptacles," issued on  
15 June 4, 2002, which is herein incorporated by reference in its entirety.

Referring back to FIG. 2, the illustrated embodiment of the device 200 includes a total of six lower output receptacles 208c-208h. More specifically, each of the lower output receptacles 208c-208h includes a first portion designated as an escrow compartment 205a-205f and a second portion designated as a storage cassette 207a-207f.  
20 Typically, documents are initially directed to the escrow compartments 205, and thereafter at specified times or upon the occurrence of specified events, which may be selected or programmed by an operator, documents are then fed to the storage cassettes 207. The storage cassettes 207 are removable and replaceable, such that stacks of documents totaling a predetermined number of documents or a predetermined monetary  
25 value may be accumulated in a given storage cassette 207, whereupon the cassette may be removed and replaced with an empty storage cassette. In the illustrated embodiment, there are six lower output receptacles 208c-208h which include escrow compartments 205 and storage cassettes 207a-207f. In alternative embodiments, the device 200 may contain more or less than six lower output receptacles which include escrow  
30 compartments 205 and storage cassettes 207. In other alternative embodiments, modular lower output receptacles 208 may be implemented to add many more lower output

receptacles to the device 200. Each modular unit may comprise two lower output receptacles. In other alternative embodiments, several modular units may be added at one time to the device 200.

A series of diverters 237a-237f, which are a part of the transport mechanism 206, direct the documents to one of the lower output receptacles 208c-208h. When the diverters 237 are in an upper position, the documents are directed to the adjacent lower output receptacle 208. When the diverters 237 are in a lower position, the documents proceed in the direction of the next diverter 237. Alternatively, the operator may instruct the device 200 to direct substitute currency media to one or more of the upper output receptacles 208a-208b such that only currency bills are presented to the diverters 237a-237f.

Additional details concerning the lower output receptacles 208c-208h, the escrow compartments 205, and the storage cassettes 207 are disclosed in commonly assigned U.S. Patent Application Serial Number 09/502,666, entitled "Currency Handling System Having Multiple Output Receptacles," incorporated by reference above. It should be emphasized that the operator may also instruct the device 200 to direct substitute currency media to one or more of the lower output receptacles 208. In the illustrated embodiment, only currency bills are directed to the lower output receptacles 208, however, in alternative embodiments, substitute currency media could also be directed to one or more of the lower output receptacles 208.

In some embodiments, the device 200 is dimensioned to process a stack of different sized currencies at the same time. In other embodiments, the device 200 can also be dimensioned to process a stack of different sized currencies and substitute currency media at the same time. For example, one application may require the processing of United States dollars (2.5 inches x 6 inches, 6.5 cm x 15.5 cm) and French currency (as large as 7.17 inches x 3.82 inches, 18.2 cm x 9.7 cm). The application may simply require the segregation of the U.S. currency from the French currency wherein the device 200 delivers U.S. currency to the first lower output receptacle 208c and the French currency to the second output receptacle 208d. In still other embodiments, the device 200 processes a mixed stack of U.S. ten and twenty dollar bills and French one hundred and two hundred Franc notes wherein the currency documents are denominated, counted,



and authenticated. In such embodiments, the U.S. ten and twenty dollar bills are delivered to the first 208c and second 208d lower output receptacles, respectively, and the French one hundred and two hundred Franc notes are delivered to the third 208e and fourth 208f lower output receptacle, respectively. In yet other embodiments, the device

5 200 denominates, counts, and authenticates six different types of currency wherein, for example, Canadian currency is delivered to the first lower output receptacle 208c, United States currency is delivered to the second output receptacle 208d, Japanese currency is delivered to the third lower output receptacle 208e, British currency is delivered to the fourth lower output receptacle 208f, French currency is delivered to the fifth lower output

10 receptacle 208g, and German currency is delivered to the sixth lower output receptacle 208h. In still other embodiments, no call bills or other denominations of foreign currency, such as Mexican currency for example, may be directed to the second upper output receptacle 208b. In other embodiments, suspect bills are delivered to the first upper output receptacle 208a. In still other embodiments, U.S. currency and cashout

15 tickets are delivered to different output receptacles. These embodiments represent just a few examples of the numerous combinations of U.S. currency bills, foreign currency bills, and substitute media that can be delivered to the output receptacles 208.

Additional details concerning the processing of foreign currency are disclosed in commonly assigned U.S. Patent Number 5,875,259, entitled "Method and Apparatus for

20 Discriminating and Counting Documents"; commonly assigned U.S. Patent Number 5,960,103, entitled "Method and Apparatus for Authenticating and Discriminating Currency"; commonly assigned U.S. Patent Application Serial Number 09/626,324, entitled "Currency Handling System Employing an Infrared Authenticating System," filed July 26, 2000; and commonly assigned U.S. Patent Application Serial Number

25 09/179,573, entitled "Customizable International Note Counter," filed October 27, 1998, each of which is incorporated herein by reference in its entirety.

In other alternative embodiments of the device 200, the user can vary the type of documents delivered to the output receptacles 208. For example, in one alternative embodiment an operator can direct, via the control unit 216 (shown in FIG. 2), that a

30 stack of one, five, ten, twenty, fifty, and one-hundred United States dollar bills be denominated, counted, authenticated, and directed into lower output receptacles 208c-

208h, respectively. In still another alternative embodiment, the device 200 is also instructed to deliver other currency bills, such as a United States two dollar bill or foreign currency bills that have been mixed into the stack of documents, to the second upper output receptacle 208b. In still another alternative embodiment, the device 200 is also  
5 instructed to count the number and aggregate value of all the currency bills processed and the number and aggregate value of each individual denomination of currency bills processed. These values may be communicated to the user via the display/user-interface 217 of the device 200. In addition, or alternatively, these values are communicated to a remote device via a communications port (not shown).

10 In still other alternative embodiments, no call bills and bills that are stacked upon one another are directed to the second upper output receptacle 208b. In yet other alternative embodiments, the operator can direct that all documents failing an authentication test be delivered to the first upper output receptacle 208a. In still further embodiments, the operator instructs the device 200 to deliver no call bills, suspect bills,  
15 stacked bills, *etc.* to one of the lower output receptacles 208c-208h. In yet other alternative embodiments, the currency bills are directed to one or more of the lower output receptacles 208c-208h, no call bills and suspect bills are directed to the upper output receptacle 208a, and substitute currency media are directed to the upper output receptacle 208b. In still other embodiments, U.S. currency bills are directed to selected  
20 ones of the lower output receptacles 208, foreign currency bills are directed to other lower output receptacles 208, no call bills, suspect bills, and invalid substitute currency media (*i.e.*, media which cannot be identified) are directed to the first upper output receptacle 208a, and valid substitute currency media are directed to the second upper output receptacle 208b. Alternatively, a third upper output receptacle (not shown) may  
25 receive invalid substitute currency media so as to keep all substitute currency media separate from currency bills.

In still other alternate embodiments, genuine U.S. currency bills and foreign currency bills and identified substitute currency are directed to selected ones of the lower output receptacles 208, unidentified substitute currency media are directed to the first  
30 upper output receptacle 208a, and no call currency bills and suspect currency bills are directed to the second upper output receptacle 208b. In short, the device 200 as

illustrated having eight output receptacles 208a-208h provides a great deal of flexibility to the operator. And in other alternative embodiments of the currency handling device 200 with a fewer or greater number of output receptacles 208, numerous different combinations for processing documents are available. What output receptacle receives  
5 which type of document, whether a U.S. currency bill, a foreign currency bill, or a substitute currency medium, is entirely customizable by the operator.

In the illustrated embodiment shown in FIG. 2, the various operations of the device 200 are controlled by processors disposed on a number of printed circuit boards (PCBs) located throughout the device 200. Further details concerning the PCBs are  
10 disclosed in commonly assigned U.S. Patent Application Serial Number 09/502,666, entitled "Currency Handling System Having Multiple Output Receptacles," previously incorporated by reference.

#### **Document processing device having a single output receptacle**

15 The evaluation region 104 shown and described in connection with FIGS. 1a and 1b can also be incorporated into a document processing device having a single output receptacle. FIGS. 5 and 6 illustrate a compact document processing device 500 according to one embodiment of the present invention. This device 500 is shown and described in more detail in commonly assigned United States Patent No. 5,687,963  
20 which is incorporated by reference in its entirety. In one embodiment, the device 500 is modified to include an evaluation region 104 as shown and described in connection with FIG. 1b. Documents are fed, one by one, from a stack of documents placed in an input receptacle 502 onto a transport mechanism. The transport mechanism includes a transport plate or guide plate 606 for guiding a document to an output receptacle 608.  
25 Before reaching the output receptacle 508, the document can be, for example, evaluated, analyzed, counted and/or otherwise processed by an evaluation region 604. In one embodiment of the device 500, documents are processed at a rate in excess of 600 documents per minute. In another embodiment, documents are processed at a rate in excess of 800 documents per minute. In yet another embodiment, documents are  
30 processed at a rate in excess of 1000 documents per minute. In another embodiment, documents are processed at a rate in excess of 1200 documents per minute. In still

another embodiment, documents are processed at a rate in excess of 1500 documents per minute.

The device 500 in FIG. 5 has a touch panel display 516 in one embodiment of the present invention which displays "functional" keys when appropriate. The touch panel display 516 simplifies the operation of the device 500. Alternatively or additionally physical keys, switches, or buttons may be employed, such as, for example, a keypad. In one embodiment, the touch panel display 516 includes denomination keys, such as disclosed in commonly assigned U.S. Patent No. 5,790,697, previously incorporated by reference. The operator may also manually enter, via the touch panel display 516, information about the substitute currency media, such as the information described above in connection with FIGS. 2-3.

A pair of driven stacking wheels 527a and 527b are located in the output receptacle 508 and come into contact with the documents as the documents are transported into the output receptacle 508. The stacking wheels 527a and 527b are supported for rotational movement about respective shafts journaled on a rigid frame and driven by a motor (not shown). Flexible blades of the stacking wheels 527a and 527b deliver the documents onto a forward end of a stacker plate 652 shown in FIG. 6. In an alternate embodiment, the device 500 includes a stacking wheel 527a only, a stacking wheel 527b only, or neither a stacking wheel 527a nor a stacking wheel 527b.

According to one embodiment, the document scanning device 500 is compact, having a height ( $H_1$ ) of about  $9 \frac{1}{2}$  to  $10 \frac{1}{2}$  inches, width ( $W_1$ ) of about  $10 \frac{3}{4}$  to  $11 \frac{3}{4}$  inches, and a depth ( $D_1$ ) of about 12 to 16 inches.

Like the device 200 shown and described in connection with FIGS. 2-4b, the device 500 shown and described in connection with FIGS. 5, 6 is adapted to halt or suspend operation when a no call or a suspect bill or an invalid substitute currency medium is detected. An operator of the device 500 may specify via the touch panel display 516 the location of the unidentified document, such as the last document to be presented to the output receptacle 508 before operation is halted or suspended. The operator may further manually enter information about the invalid substitute currency medium, such as the information described above in connection with FIGS. 2-3. In an embodiment in which the device 500 includes denomination keys, the operator may

select one of the denomination keys after inspection of a no call bill or a suspect bill, and resume operation as if the no call bill or suspect bill had not been flagged.

### **Document processing device having dual output receptacles**

5        FIGS. 7a and 7b illustrate an exterior perspective view and a side cross-sectional view, respectively, of a compact, document processing device 700 having dual output receptacles. The process for carrying documents through the device 700 is the same as discussed above, except that the device 700 has first and second output receptacles, 708a, 708b, respectively. A diverter 760, shown in FIG. 7b, directs the documents to either the  
10       first or second output receptacle 708a, 708b. When the diverter 760 is in a lower position, documents are directed to the first output receptacle 708a. When the diverter 760 is in an upper position, documents proceed in the direction of the second output receptacle 708b. Details of devices with multiple output receptacles are described in WO 97/45810 which is incorporated by reference in its entirety.

15       FIG. 7b shows a pair of stacker wheels 727a, 727b for delivering documents to the first and second output receptacles 708a, 708b. However, in alternate embodiments, the device 700 includes the stacker wheel 727a only, the stacker wheel 727b only, or neither the stacker wheel 727a nor the stacker wheel 727b.

      The device 700 includes an evaluation region 704, such as the evaluation region  
20       104 shown and described in connection with FIGS. 1a and 1b.

      According to one embodiment the device 700 is compact having a height ( $H_2$ ) of about 17 ½ inches, width ( $W_2$ ) of about 13 ½ inches, and a depth ( $D_2$ ) of about 15 inches. According to another embodiment, the device 700 has dimensions of: a height ( $H_2$ ) of about 18 inches; a width ( $W_2$ ) of about 13 ¾ inches; and a depth ( $D_2$ ) of about 16  
25       inches. The device 700 may be rested upon a tabletop, countertop, desk, or the like.

      Like the embodiments described above in connection with a device having multiple output receptacles, the device 700 may be instructed by an operator via a control unit 716, which may include a touch panel display or other suitable interface, to direct certain documents to one or the other of the first and second output receptacles 708a,  
30       708b. These modes may be pre-programmed or operator-defined. For example, according to one embodiment, genuine currency bills and valid substitute currency media

are directed to the first output receptacle 708a, whereas non-genuine currency bills and invalid substitute currency media are directed to the second output receptacle 708b. According to another embodiment, genuine currency bills are directed to the first output receptacle 708a, valid substitute currency media are directed to the second output  
5 receptacle 708b, and the device 700 is programmed to halt or suspend operation when a non-genuine currency bill or invalid substitute currency medium is detected by the evaluation region of the device 700. In one embodiment, the control unit 716 may include denomination keys, such as explained above. The control unit 716 may also be adapted to permit the operator to manually enter information about a flagged substitute  
10 currency medium, such as the information described above in connection with FIGS. 2-3.

#### **Document processing device coupled to a coin sorting device**

In other embodiments, the evaluation region 104 shown and described in connection with FIGS. 1a and 1b may be employed in a document processing device  
15 according to any of the embodiments just described which is coupled to a coin sorting device. In different embodiments, the coin sorting device is adapted to sort coins only or a combination of coins and tokens.

FIG. 8 illustrates a functional block diagram of a document processing device 800 coupled to a coin sorting device 8000 in accordance with one embodiment of the present  
20 invention. The document processing device 800 includes a communications port 818 and a controller 814, and is communicatively coupled to the coin sorting device 8000 via a cable 876. The coin sorting device 8000 includes a communications port 8018 and a controller 8014. The communications ports 818, 8018 may be any suitable communications port such as a serial or parallel port, USB port, and the like. In an  
25 alternate embodiment, the document processing device 800 and the coin sorting device 8000 communicate wirelessly, and the cable 876 is not included. In this alternate embodiment, the communications ports 818, 8018 are adapted to receive and transmit information wirelessly.

An operator places a stack of documents into the document processing device 800  
30 for processing, and places a plurality of coins and/or tokens into the coin sorting device 8000 for sorting and counting. The document processing device 800 processes the stack

of documents, and the controller 814 in the document processing device 800 stores information representative of the documents being processed, such as the denomination of the currency bills, the value of the substitute currency media, the number of non-genuine currency bills, the number of invalid substitute currency media, and so forth.

5 The coin sorting device 8000 sorts and counts the coins or tokens, and the controller 8014 in the coin sorting device 8000 stores information representative of the coins or tokens being sorted and counted, such as the value and denomination of the coins (penny, dime, nickel, *etc.*), the number and kind of tokens, and so forth.

In some embodiments, the stored information in the coin sorting device 8000 is transmitted to the controller 814 of the document processing device 800. The document processing device 800 organizes and presents the combined information to the operator via a display, such as a monitor or touch screen. In other embodiments, the stored information in the document processing device 800 is transmitted to the controller 8014 of the coin sorting device 8000, which organizes and presents the information combined from both devices to the operator via a display, such as a monitor or touch screen.

Referring now to FIG. 9, there is shown a coin sorter system 9000. The coin sorter system 9000 includes a coin tray 9002 which receives coins of mixed denominations. The coins are sorted, counted, and are captured in a plurality of coin bins 9008 positioned on the exterior of the coin sorter system 9000. In alternate 20 embodiments, the coins are captured in a plurality of coin bags.

The coin sorter system 9000 includes a control panel 9016. In the illustrated embodiment, the control panel 9016 includes a display 9076 for displaying information about the coin sorter system 9000 and a plurality of keys 9078 for allowing the operator to enter information to the coin sorter system 9000. In some alternate embodiments, the control panel 9016 includes a touch screen.

Additional details concerning the coin sorter system 9000 are disclosed in commonly assigned U.S. Patent Number 6,139,418, entitled "High Speed Coin Sorter Having a Reduced Size," and U.S. Patent Number 5,997,395, entitled "High Speed Coin Sorter Having a Reduced Size," each of which is herein incorporated by reference in its entirety. In one embodiment, the coin sorter system 9000 shown in FIG. 9 is modified to include a communications port such as the communications port 8018 one described in 30

connection with FIG. 8. The coin sorter system 9000 may be further modified to perform the coin sorting and authenticating functions disclosed in U.S. Patent Nos. 5,299,977, 5,453,047, 5,507,379, 5,542,880, 5,865,673 and 5,997,395, each of which is herein incorporated by reference in its entirety.

5

### **Funds processing machine**

In some embodiments, the evaluation region 104 of FIG. 1b may be incorporated into a funds processing machine capable of processing both documents and coins.

Referring now to FIG. 10a, a funds processing machine 1000 includes a touch  
10 screen 1016 to provide inputs from a user and to display outputs to be viewed by the user. While the touch screen 1016 is the preferred mode to enter data from the user, the funds processing machine 1000 may also include a mechanical keyboard, in addition to or in lieu of the touch screen 1016, to receive such inputs.

The funds processing machine 1000 includes a coin receptacle 1044 which  
15 receives coins of a single denomination or of mixed denominations from a user. Additionally, an input receptacle 1002 is included within the funds processing machine 1000. The input receptacle 1002 is illustrated in its open position in FIG. 10a and may be retracted by the funds processing machine 1000 once the bulk currency has been placed therein by the user. These input devices 1044 and 1002 allow the user of the  
20 funds processing machine 1000 to input his or her funds which will ultimately be converted to some other sort of fund source that is available to the user. In addition to banknotes, the input receptacle 1002 of the funds processing machine 1000 can also accommodate casino script, paper tokens, or bar coded tickets.

The funds processing machine 1000 includes a dispenser 1008a and a dispensed  
25 coin receptacle 1046 for dispensing to the user the desired amount of funds in both bank notes and coins. A return slot 1008b may also be included within the funds processing machine 1000 to return currency bills or substitute currency media to the user which cannot be authenticated or otherwise processed. Coins which cannot be authenticated may be returned to the user via the dispensed coin receptacle 1046. The funds processing  
30 machine 1000 further includes a document dispenser 1020 for providing a user with a receipt of the transaction that he or she has performed.



In its simplest form, the funds processing machine 1000 receives funds (currency, coins, substitute currency media) via the coin input receptacle 1044 and the input receptacle 1002, and after these deposited funds have been authenticated and counted, the funds processing machine 1000 returns to the user an amount equal to the deposited funds but in a different variation of bank notes and coins. For example, the user of the funds processing machine 1000 may input \$102.99 in various small bank notes and pennies and in turn receive a \$100 bank note, two \$1 bank notes, three quarters, two dimes, and four pennies. Alternatively, the funds processing machine 1000 may simply return a receipt of the transaction or a barcoded ticket through the document dispenser 1020 which the user can redeem for funds by an attendant of the funds processing machine 1000. Alternatively, the funds processing machine 1000 can credit a user's account.

The funds processing machine 1000 may also include a media reader slot 1042 into which the user inserts his or her identification card so that the funds processing machine 1000 can identify the user. The touch screen 1016 typically provides the user with a menu of options which prompts the user to carry out a series of actions for identifying the user by displaying certain commands and requesting that the user depress touch keys on the touch screen 1016 (e.g., a user PIN). The funds processing machine 1000 includes a card media reader device which is capable of reading from or writing to one or more types of card media. This media may include various types of memory storage technology such as magnetic storage, solid state memory devices, and optical devices.

FIG. 10b illustrates the funds processing machine 1000 in a side view illustrating the various modules. The document processing module 1004 receives documents from the input receptacle 1002 for processing. The inward movement of the input receptacle 1002 positions a stack of documents at the feed station of the document scanning and counting device which automatically feeds, counts, scans, authenticates, and sorts the documents, one at a time at a high rate of speed (e.g., at least 350 documents per minute). In place of or in addition to the input receptacle 1002, the funds processing machine 1000 may include a single document receptacle which receives and processes one document at a time. The documents that are recognized by the document processing module 1004 are

delivered to a storage area such as a currency canister (not shown). When a document cannot be recognized by the document processing module 1004, it is returned to the customer through the return slot 1008b. Exemplary machines which scan, sort, count, and authenticate currency bills as required by the bank note processing module are described in U.S. Patent Nos. 5,295,196, 5,870,487 and 5,875,259, each of which is incorporated by reference herein in its entirety.

In place of or in addition to the input receptacle 1002, the funds processing machine 1000 may include an input receptacle slot which receives and processes one document at a time. Such an input receptacle slot would be placed at the front of the funds processing machine 1000.

Additional details of the funds processing machine 1000 are disclosed in commonly assigned, co-pending U.S. Patent Application Serial Number 09/562,231, entitled "Currency Processing Machine with Multiple Internal Coin Receptacles," which is herein incorporated by reference in its entirety.

In accordance with the present invention, the document processing module 1004 of the funds processing machine 1000 shown in FIG. 10b and described in U.S. Patent Application Serial No. 09/562,231 is modified to incorporate the evaluation region 104 shown and described in connection with FIGS. 1a and 1b. The user deposits currency bills and substitute currency media into the input receptacle 1002. As described in more detail below, the funds processing machine 1000 may be communicatively coupled to a casino gaming network. In such an embodiment, a casino customer may deposit a stack of casino cashout tickets and currency bills into the input receptacle 1002, and the machine 1000 queries the casino gaming network for the payout amounts associated with the casino cashout tickets. This payout amount may be added to the customer's total such that the customer is dispensed (via the dispenser 1008a for example) the total amount of currency deposited plus the value of any payout associated with valid cashout tickets.

The funds processing machine 1000 also includes a coin processing module 1048. The coin processing module 1048 sorts, counts and authenticates the mixed coins which are deposited in the coin input receptacle 1044 which leads directly into the coin processing module 1048. The coins are sorted in the coin processing module 1048 in a

variety of ways but the preferred method is a sorting based on the diameter of the coins. When a non-authenticated coin is determined by the coin processing module 1048, it is directed through a coin reject tube 1054 towards the dispensed coin receptacle 1046. Thus, the user who has entered such a non-authenticated coin can retrieve the coin by  
5     accessing the dispensed coin receptacle 1046. Coin sorting and authenticating devices which can perform the function of the coin processing module 1048 are disclosed in U.S. Patent Nos. 5,299,977, 5,453,047, 5,507,379, 5,542,880, 5,865,673 and 5,997,395, previously incorporated by reference. Alternatively, other coins sorters such as a rail sorter can be used to perform the function of the coin processing module 1048.

10     The funds processing machine 1000 further includes a document dispensing module 1040 which is connected via transport mechanism 1006 to the dispenser 1008a that is accessible by the user. The document dispensing module 1040 typically dispenses loose bills in response to a request of the user for such bank notes. Also, the document dispensing module 1040 may be configured to dispense strapped notes into the dispenser  
15     1008a if that is desired. In one embodiment of the present invention, the user may select the denomination of the loose or strapped bills dispensed to the user. As noted above, the document dispensing module 1040 is modified in one embodiment to dispense both currency bills and substitute currency media. For example, in one embodiment, the document dispensing module 1040 may return to the user invalid substitute currency  
20     media. In addition, as mentioned above, the document dispensing module 1040 may dispense a barcoded ticket which the customer may redeem for funds.

The funds processing machine 1000 also includes a coin dispensing module 1050 which dispenses loose coins to the user via the dispensed coin receptacle 1046. The coin dispensing module 1050 is connected to the dispensed coin receptacle 1046 via a coin  
25     tube 1056. Thus, the user of the funds processing machine 1000 has the ability to select the desired coin denominations that he or she will receive in response to a transaction.

The coins which have been sorted into their denomination by the coin processing module 1048 are sent to coin tubes 1058 which correspond to each specific denomination. The coin tubes 1058 lead to a coin receptacle station 1052 for each of the  
30     denominations that are to be sorted and authenticated by the coin processing module 1048.

The funds processing machine 1000 includes a controller 1014 which is coupled to each module 1004, 1040, 1048, 1050 and 1052 within the funds processing machine 1000 and controls the interaction between each module. For example, the controller 1014 may review the input totals from the funds processing modules 1004 and 1048 and  
5 direct an appropriate funds output via the funds dispensing modules 1040 and 1050. The controller 1014 also directs the operation of the coin receptacle stations 1052 as described below. While not shown, the controller 1014 may also be coupled to a media reader associated with the media reader slot 1042 and also to a printer at the document dispenser 1020, if these devices are present in the funds processing machine 1000. The  
10 printer, for example, may print a barcoded ticket representative of the amount of funds deposited by the customer, or the printer may print a receipt of the transaction.

#### **Document processing device coupled to a computer network**

According to some embodiments of the present invention, any of the foregoing  
15 systems may be communicatively coupled to a computer network, such as a casino gaming machine network or a retailer network. Examples of such embodiments will be discussed next.

FIG. 11 illustrates a host system 1190 coupled to a plurality of document processing devices 1100a, 1100b, . . . 1100n. The document processing devices 1100a,  
20 1100b, . . . 1100n may be any device shown or described in connection with FIGS. 2-10b. The host system 1190 is further coupled to a computer network 1192. The computer network 1192 provides the host system 1190 with real time information, such as information relating to the demands for particular types of coin receptacles and information about the substitute currency media detected by the document processing  
25 devices 1100a-n. In alternate embodiments, the computer network 1192 may be a casino gaming machine network or a retailer network. Each of these embodiments is discussed next.

In one embodiment, the computer network 1192 is a casino gaming machine network and includes a database for storing information about barcoded tickets that have  
30 been dispensed by the casino's gaming machines. When a barcoded ticket is dispensed, the ticket number is stored in a database along with the payout amount. A barcode, such

as barcode 138 shown in FIG. 1b, encodes the ticket number and the payout amount. When the bareoded ticket is deposited into the document processing device 1110, the evaluation unit 104 of the document processing device 1100 reads the barcode on the barcoded ticket. If a valid barcode is read, the document processing device 1100  
5 transmits the barcode number to the host 1190. The host 1190 queries the computer network 1192 for the payout amount associated with the barcoded number, and transmits the payout amount back to the document processing device 1100. The document processing device 1100 adds the payout amount to the running total of currency deposited by the operator into the machine 1100.

10 Alternatively, the barcode numbers associated with barcoded tickets identified by the document processing device 1100 are stored in the document processing device 1100. These numbers are periodically provided to the casino gaming machine network 1192. The casino machine gaming network 1192 may include a casino accounting system. The numbers are matched up with the payout amounts stored in a database associated with the  
15 casino machine gaming network 1192, and the payout amounts may then be reconciled in the casino accounting system.

In another embodiment, the casino gaming machine network 1192 is a retailer network that includes a retailer database for storing information about promotional media. For example, a retailer customer may deposit both currency bills and substitute  
20 currency media such as store coupons or gift certificates into a self-checkout station at the point of sale. The documents deposited at the self-checkout stations are deposited into a document processing device 1100. Documents from cash register tills may also be deposited into a document processing device 1100. The document processing device 1100 rapidly processes the documents, and identifies the barcode numbers from the  
25 barcoded media. These barcode numbers are then transmitted to the retailer network which determines the values associated with the barcode numbers (such as fifty cents off, or a \$50 gift certificate) by querying the retailer database. These values are then reconciled in the retailer's accounting system. Optionally, these values may be transmitted back to the document processing device 1100 for display to the customer.

30

### Operation of document processing device

Turning now to FIG. 12, there is shown a flowchart describing the operation of a document processing device according to one embodiment of the present invention. Operation begins when an operator deposits documents into an input receptacle of a document processing device (step 1200). Operation may commence automatically, such as when a sensor detects the presence of documents in the input receptacle, or manually, such as when the operator actuates a switch, key, or button on the document processing device. The documents may include a combination of mixed currency bills and substitute currency media, or the documents may include currency bills only or substitute currency media only.

In some embodiments, the input receptacle is adapted to receive a stack of documents. In other embodiments, the input receptacle is adapted to receive one document at a time. The deposited documents are transported, one at a time, along a transport mechanism in the document processing device. In step 1202, a first document is transported past a media detector. In some embodiments, the media detector comprises a barcode reader adapted to scan for barcodes on a document. In step 1204, the media detector provides a signal representative of whether a valid substitute currency medium was detected. For example, if the barcode reader provides a "good read" signal in response to scanning the first document, the first document is a valid medium. However, if the barcode provides a "no read" signal, the first document is not a valid medium. If the first document is a valid medium, the first document is transported to an output receptacle (step 1206). Which output receptacle receives the first document depends on which output receptacle has been specified according to a preprogrammed or operator-defined mode. If there is only one output receptacle on the document processing device, then the first document is transported to that output receptacle.

Note that between steps 1204 and 1206, in some embodiments, the first document may be first transported to a bill facing mechanism before being transported to an output receptacle. According to some of such embodiments, the document processing device is adapted to determine which orientation the first document is facing, and if the first document is facing the wrong orientation, it can be transported to a bill facing mechanism. Alternatively, the desired face orientation can be predetermined either by

the manufacturer or the operator. In other embodiments, the first document is not transported to a bill facing mechanism.

If a valid medium is not detected at step 1204, the document is transported past a currency detector at step 1208. If the currency detector detects an authentic currency bill (step 1210), the first document is transported to a pre-selected or operator-defined output receptacle at step 1212. The document processing device can also determine the denomination of the currency bill, and transport the first document to the appropriate output receptacle according to operator-specified instructions or preprogrammed instructions. In some embodiments, a genuine currency bill may optionally be transported to a document facing mechanism, such as the document facing mechanism 203 shown in FIGS. 2 and 3, for proper orientation before being transported to an output receptacle if the currency detector determines that the currency bill is not properly oriented.

In other embodiments, steps 1208 and 1202 are reversed, such that a document is first transported past a currency detector and then past a media detector. In still other embodiments, steps 1202 and 1208 (or steps 1208 and 1202) are performed before steps 1204 and 1210 (or steps 1210 and 1204). In other words, in these other embodiments, the documents are transported past the media and currency detectors (in any order), and then the document processing device determines whether the document is a valid medium or authentic currency bill. Note that in the embodiments in which the document processing device has only a single output receptacle, steps 1206 and 1212 are identical because both valid media and authentic currency are transported to the same output receptacle.

At step 1214, the document processing device determines whether it is instructed to halt on detecting an unacceptable document, *i.e.*, a document that is neither valid media nor authentic currency, such as a blank piece of paper. These instructions may be operator-specified or preprogrammed. In some embodiments, the document processing device is adapted to determine whether an unacceptable document is an invalid medium or a non-genuine currency bill, and can receive separate instructions on handling each. If the device is instructed to halt on detecting an unacceptable document, the operation of the device is halted or suspended at step 1216 to permit inspection and/or removal of the

unacceptable document. At step 1218, operation of the device is restarted once the unacceptable document has been inspected and/or removed from the document processing device, and operation continues at either steps 1200 or 1222 depending on pre-programmed or operator-specified instructions. In some embodiments, the operator  
5 may, upon inspection, determine a bill's denomination. In such embodiments, the operator may manually enter the denomination of a currency bill, such as via a denomination key, deposit the bill into an output receptacle, and resume operation. In another embodiment, the operator may, upon inspection, determine information about the unacceptable substitute currency medium, such as the information described above.

10 Returning to step 1214, if the document processing device is instructed to offsort unacceptable documents, the unacceptable document is transported to the offsort receptacle at step 1220. The particular offsort receptacle which is to receive unacceptable documents may be operator-specified or preprogrammed. In embodiments in which the device is adapted to discriminate between invalid media and non-genuine  
15 currency bills, the unacceptable document may be routed to one of two offsort receptacles depending on what kind of unacceptable document was detected. This routing decision may be made under the control of operator-specified or preprogrammed instructions.

If there are no further documents to be processed at step 1222, the device may  
20 optionally display information associated with the processed documents at step 1224. This information may include any combination of the following according to one or more different embodiments: the total amount of authentic currency bills processed (*e.g.*, \$15,567); a breakdown of the denominations of currency bills processed (*e.g.*, 140 \$1 bills, 147 \$5 bills, 268 \$10 bills, and so on); the total number of valid media detected  
25 (*e.g.*, 156 pieces of valid media processed); barcode information detected from barcoded media (*e.g.*, barcode number 12345678); the total number of flagged currency bills processed (*e.g.*, 5 flagged bills, where 3 bills are no call bills, 1 bill is a suspect bill, and 1 bill is both suspect and no call); the total number of invalid media detected (*e.g.*, 16 pieces of invalid media processed); the total amount of media detected (*e.g.*, \$10,000 in  
30 media processed); the total number of unidentified documents--*i.e.*, documents which were neither determined to be a currency bill nor a valid substitute currency medium,



such as a blank piece of paper for example--detected (e.g., 27 pieces of unidentified documents processed); why a particular currency bill was not authenticated (e.g., 4 bills failed magnetic strip test, 2 bills failed ultraviolet test); the total number of documents processed (e.g., 11,253 documents processed); the number of batch identification cards processed (e.g., 4 batch identification cards processed); identification information of the gaming machine from which a batch of currency bills and substitute currency media originated based on information encoded on a batch identification card (e.g., batch identification card number 12345 which identifies gaming machine number 42); and other suitable information.

At step 1226, the device may optionally generate a report based on some or all of the information displayed at step 1224. This report may be formatted and displayed to the operator, and/or it may be printed, and/or it may be transmitted to a network computer for storage or further manipulation.

Note that in the embodiments described in connection with FIG. 12, the device may further include a coin sorting device in which coins are also processed. The information associated with the processed coins may be combined with the information associated with the processed documents. A single or separate reports may be generated based on the processed coins and processed documents.

Turning now to FIG. 13, there is shown a flowchart further describing the operation of a document processing device according to any embodiment described in connection with FIG. 12. At step 1300, documents are deposited into an input receptacle of a document processing device. The documents may include a combination of mixed currency bills and substitute currency media, or they may include currency bills only or substitute currency media only. At steps 1302 and 1304, the device determines whether a first document is a valid barcoded ticket or whether a first document is an authentic currency bill. Note that steps 1302 and 1304 can be performed in any order. If a document is determined to be a valid barcoded ticket, the barcode number associated with the barcoded ticket is stored in a memory location at step 1306. At step 1308, if a document is determined to be an authentic currency bill, the value of the currency bill is added to the value of all authentic currency bills scanned since step 1300. This value may be initialized to zero or may be initialized to some other number, such as a number

representing the total amount of another batch of currency bills which was processed by the document processing device. If the first document is determined to be neither a valid barcoded ticket nor an authentic currency bill, it may be processed at step 1310 in accordance with steps 1214, 1216, 1218, and 1220 described in connection with FIG. 12  
5 hereinabove.

At step 1312, the device determines whether any more documents remain to be processed. If there are, operation continues at step 1302 until there are no further documents to be processed. If no further documents are to be processed, the device retrieves the values associated with the stored barcode numbers from a computer network  
10 at step 1314. Alternatively, after each instance in which the device detects a barcode number, the device may retrieve the value associated with the barcode number from the computer network. The computer network may be a casino gaming machine network or a retailer network, for example. In a casino gaming environment, the barcode numbers may be associated with barcoded cashout tickets. In the retailer environment, the  
15 barcode numbers may be associated with store coupons, gift certificates, or other barcoded promotional media. In the casino gaming environment, one or more databases may be linked to provide information about the player who redeemed the ticket, when the ticket was dispensed, when the ticket was redeemed, and so forth, based on the barcode number from a cashout ticket. In the retailer environment, one or more databases may be  
20 linked to provide information about the product associated with the promotion, manufacturer data, and customer information based on data associated with customer loyalty cards, for example. This information and the other information described in connection with FIG. 12 may be included in a report generated by the device at step 1316. All or a portion of this generated report may be displayed and/or printed and/or  
25 stored or transmitted for later retrieval or further manipulation.

Additional details concerning the operation of a document processing device according to the present invention may be found in connection with the description of FIGS. 1a-11 above.

FIG. 13a illustrates a method of processing documents including currency bills  
30 and substitute currency media bearing more than one barcode pattern in a document processing device according to any embodiment described in connection with FIG. 12. A

plurality of documents are deposited into an input receptacle of a document processing device at step 1320. The document processing device determines whether the documents under consideration is an authentic currency bill at step 1322. If the document is an authentic currency bill, the bill's denomination is determined and, at step 1326, the value of the bill is added to a running total of the value of currency bills processed. If the document is determined not to be an authentic currency bill, the document processing device checks whether the document is a valid substitute currency medium at step 1324. Note that the sequence of steps shown in FIG. 13a are not necessarily presented in the order in which they are performed. For example, step 1324 could be performed before or concurrently with step 1322.

In the specific case where the substitute currency media are barcoded tickets, a valid substitute currency medium is detected when a media detector successfully decodes the barcode patterns imprinted on the barcoded ticket into sets of meaningful characters. In a specific embodiment, one set of meaningful characters is a ticket number, and another set of meaningful characters is a value or amount of currency. Thus, a value of \$12BB, for example, would not be a meaningful set of characters and the document would be flagged as an invalid substitute currency medium and processed as such at step 1334. Similarly, the ticket numbers may have to conform to a set of predetermined rules, such as being a six-digit number followed by an alphabet letter. Thus, a ticket number of 1234567 would not be a meaningful set of characters, and a document bearing that ticket number would be flagged and processed as an invalid substitute currency medium.

At step 1334, operation of the document processing device may be halted or suspended, or the invalid substitute currency medium may be directed to a reject output pocket, for example. If a valid substitute currency medium is detected, the first barcode pattern is decoded into a ticket number at step 1328. The second barcode pattern is decoded into a value at step 1330, and the ticket number and the value are stored to a file at step 1332.

At step 1336, the document processing device determines whether there are any more documents to be processed. If so, processing continues at step 1322. If there are no further documents to be processed, the document processing device transmits the ticket numbers and values generated at either or both of steps 1326 and 1332 to an

accounting system for reconciliation at step 1338. Alternately, the document processing device can copy the file to a storage medium such as a floppy disk. The machine operator may then present the floppy disk to the accounting system for reconciliation. At step 1340, an optional report may be generated containing a summary of the processed documents.

### Control unit

Referring back to FIG. 1a, there is shown a control unit 116 which may be employed in any embodiment shown or described herein. As previously explained, the control unit 116 may comprise a desktop computer comprising a monitor and keyboard; a touch screen; or a panel including a display and keys, switches, or buttons. In addition, the control unit 116 may comprise a touch/video display, which is described below.

FIG. 14 illustrates a functional block diagram of a touch/video display 1400 according to one embodiment of the present invention. The touch/video display 1400 is a display that comprises a touch portion 1402 and a video portion 1404. The touch portion 1402 of the display 1400 operates as a touch screen, accepting input from the operator through actuation of specific areas 1406, 1408 on the touch portion 1402. The touch portion 1402 may also display information to the operator. The video portion 1404 of the display operates as a video display. For example, an operator of a document processing device in accordance with any embodiment shown or described herein may need assistance in operating the device. In a training mode, for example, the touch/video display 1400 would receive input from the operator indicating a desired area of training (such as clearing document jams, for example) via the touch portion 1402 of the touch/video display 1400, and would display a video presentation, for example, of the desired area of training on the video portion 1404. The video presentation could direct the operator to perform various tasks as part of the training mode, pausing to permit the operator to complete a task, and then resuming when the operator so indicates by touching a specific area on the touch portion 1402 of the touch/video display 1400, such as specific area 1406. In alternate embodiments, the touch/video display 1400 may be employed to provide interactive help or instructional presentations regarding various

operations of the document processing device, or to communicate messages such as advertisements or other information to an operator.

As described above, an operator may select via the control unit 116 any one of a multitude of preprogrammed or user-defined modes, such as those disclosed in U.S. Patent No. 6,278,795, entitled "Multi-Pocket Currency Discriminator," and in co-pending U.S. Patent Application Serial No. 09/635,181, entitled "Method of Creating Identifiable Smaller Stacks of Currency Bills Within a Larger Stack of Currency Bills," and U.S. Patent Application Serial No. 09/688,538, entitled "Currency Handling System Having Multiple Output Receptacles," which was filed on October 16, 2000, previously incorporated by reference. The operator may select these and other modes via an interface such as the control unit 116 shown in FIG. 1a and described above.

### **System of networked document processing devices**

FIG. 15 is a diagram of a system 1500 for processing currency bills and substitute currency media which generally includes gaming machines 1502, 1504, 1506, document processing devices 1508, 1510, and a network 1512. While FIG. 15 describes embodiments in a casino environment, other environments such as a retailer or an amusement park, for example, are contemplated. In a retailer environment, the gaming machines 1502, 1504, 1506 are replaced with document accepting devices, such as self-checkout stations. In an amusement park environment, the gaming machines 1502, 1504, 1506 may be replaced with vending machines or other document accepting devices suitable for use in amusement park environments. In short, the gaming machines 1502, 1504, 1506 may be any document accepting device suitable for use in a particular environment. A document accepting device includes a document acceptor for accepting a document, such as a currency bill or a substitute currency medium.

A casino environment includes a first gaming machine 1502, a second gaming machine 1504, and an nth gaming machine 1506 arranged about a casino floor. Casino patrons play games of chance on the gaming machines 1502, 1504, 1506 during which currency bills and substitute currency media are received and dispensed. At certain predetermined times, such as daily, hourly, every six hours, and so forth, or upon the occurrence of certain events, such as a full condition reported by a bill validator box, a

casino operator empties the bill validator boxes which contain stacks of documents 1518, 1520, 1522 from the gaming machines 1502, 1504, 1506, respectively. The stacks of documents 1518, 1520, 1522 are brought into a soft-count room in a secure area of the casino for processing. One or more of the stacks of documents retrieved from the gaming machines are deposited into an input receptacle of a document processing device within the soft-count room. In FIG. 15, the stacks of documents 1518, 1520 retrieved from the first gaming machine 1502 and the second gaming machine 1504 are deposited into the input receptacle of a first document processing device 1508. The stack of documents 1522 retrieved from the nth gaming machine 1506 is deposited into the input receptacle of a mth document processing device 1510.

The document processing devices 1508, 1510 may be any document processing device shown and described above such as those described in connection with FIGS. 1a-11. They are communicatively linked via a host 1536 to the network 1512 such as described in connection with FIG. 11. The first document processing device 1508 processes the stack of documents deposited in its input receptacle and identifies authentic currency bills and their denominations, no call bills, suspect bills, valid substitute currency media, or invalid substitute currency media. Depending on the number of output receptacles present in the document processing device 1508, authentic, no call, and suspect bills and valid and invalid substitute currency media will be directed to one or more of the output receptacles of the machine 1508. Likewise, the mth document processing device 1510 processes authentic currency bills whose denominations can be determined, valid substitute currency media, no call and suspect bills, and invalid substitute currency media.

In some embodiments where the substitute currency media include a barcode pattern encoding a ticket number, the ticket numbers of the valid substitute currency media processed in the document processing devices 1508, 1510 are stored in a file in a storage medium such as the storage medium 119 shown in FIG. 1c. The file containing the ticket numbers is presented to a ticket tracking system 1516 which, according to one embodiment, is coupled to the network 1512. In other embodiments, the ticket numbers are stored in a floppy disk which is presented to the ticket tracking system 1516. The ticket tracking system 1516 compares the ticket numbers in the file with the ticket

numbers stored in a ticket database 1538 and retrieves the values associated with each ticket number from the ticket database 1538. The ticket numbers and values are presented to an accounting system 1514 for reconciliation.

The gaming machines 1502, 1504, 1506 are communicatively coupled to the  
5 network 1512. In one embodiment, the information encoded on the batch identification cards placed in the gaming machines is maintained in the accounting system 1514, which information includes the identity of the gaming machine in which the batch identification card is placed. The batch identification cards may be generated by a portable device carried by casino operators who empty the bill validator boxes from the gaming  
10 machines. When a bill validator box is emptied, the portable device dispenses a batch identification card bearing a barcode pattern representative of the name or number of the gaming machine into which the card is placed. After the bill validator box fills up with currency bills and substitute currency media, the batch identification card, the currency  
15 bills, and the substitute currency media are placed into a document processing device for processing. The barcode on the batch identification card is decoded and stored in a file along with information about the currency bills and substitute currency media processed by the document processing device.

FIG. 16 is a diagram of a system 1600 for processing currency bills and substitute currency media which generally includes a gaming machine 1602 coupled to a network  
20 1604. The network 1604 is coupled to an accounting system 1606 and a ticket-tracking system 1608. The casino operator optionally places a batch identification card at the bottom of the bill validator box in the gaming machine 1602. The batch identification card includes a barcode pattern that encodes the identity of the gaming machine and/or is otherwise associated with the gaming machine such as by the accounting system  
25 associating the barcoded information on the card with the particular gaming machine. During operation, casino patrons will insert currency bills and substitute currency media into the bill acceptor slot of the gaming machine 1602. At predetermined intervals (hourly, daily, *etc.*) or upon the occurrence of a certain condition (*e.g.*, the bill validator box is full), the casino operator will remove the bill validator box and bring it into the  
30 casino's soft-count room. The bill validator box contains a stack of documents 1616 that

includes a batch identification card 1610, a plurality of currency bills 1612, and a plurality of barcoded tickets 1614.

The casino operator removes the stack of documents 1616 and places them into the input receptacle of a document processing device 1650. The document processing  
5 device 1650 may be any document processing device shown and described in connection with FIGS. 1a, 1b, or 1c. In the illustrated embodiment, the documents are transported, one at a time, past one or more currency detectors 1618 and one or more barcode readers 1620, though not necessarily in that order. The currency detector 1618 is adapted to detect characteristic information associated with the authenticity and denomination of  
10 currency bills, and communicates information indicative of the denomination of an authentic currency bill to a controller in the document processing device. The denomination information is stored as processed document data 1630.

If the document under consideration includes one or more barcode patterns, the barcode patterns on the ticket are scanned by the barcode reader(s) 1620 and decoded  
15 into characters. For example, the barcode pattern on a batch identification card would be decoded into a batch identification number 1622, which is a number associated with the gaming machine 1602. A first barcode pattern of a multi-barcode ticket would be decoded into a ticket number 1624. A second barcode pattern would be decoded into a value 1626 representing the currency amount for which the barcoded ticket was  
20 redeemed. The values of the authentic currency bills processed, the batch identification number 1622, the ticket numbers 1624, and the values 1626 form the processed document data 1630. The processed document data 1630 is stored in a file on a floppy disk, a hard drive, a network drive, or any other suitable storage medium.

After the documents are processed, they are directed to one or more output  
25 receptacles at step 1628. The processed document data 1630 is provided to the network 1604. In an alternate embodiment, the processed document data 1630 may be provided to the accounting system 1606 or the ticket tracking system 1608. When the processed document data 1630 includes ticket numbers and values, the processed document data 1630 can be provided either via the network 1604 or directly to the accounting system  
30 1606 for reconciliation.



The gaming machine 1602 is also coupled to the network 1604. The gaming machine 1602 produces preprocessed document data 1632 during operation. The preprocessed document data 1632 includes information about the currency bills inserted into the bill validator or acceptor in the gaming machine 1602 and information about the barcoded tickets redeemed at the gaming machine 1602. The preprocessed document data 1632 is provided via the network 1604 to the accounting system 1606 or the ticket tracking system 1608. After the processed document data 1630 is received in the accounting system 1606, the two sets of data are compared for discrepancies.

The ticket tracking system 1608 keeps track of the tickets dispensed and the tickets redeemed, and prevents redemption of the same ticket number more than once. For example, when a casino patron redeems a bareoded ticket at the gaming machine 1602, the ticket number may be flagged by the ticket tracking system 1608 as redeemed. Thus, for example, if the casino patron attempted to redeem a photocopy of the barcoded ticket he just redeemed, the ticket tracking system 1608 would inform the gaming machine 1602 not to award any credits or dispense any currency bills for that ticket.

In some embodiments, the bill validator in the gaming machine 1602 is adapted to detect only the ticket number from a barcoded ticket, even if the value is also encoded on the ticket. In such embodiments, when the barcoded ticket is redeemed in the bill validator of the gaming machine 1602, the gaming machine 1602 transmits the ticket number to the ticket tracking system 1608. The ticket tracking system 1608 looks up the ticket number in a database 1634, and the database 1634 returns the value associated with that ticket number. The ticket tracking system 1608 then credits the gaming machine 1602 with the value retrieved from the ticket database unless the ticket database 1608 indicates that the ticket has already been redeemed.

In other embodiments, the casino patron redeems a ticket at a redemption machine (not shown) by inserting the ticket into the device which validates the ticket and dispenses currency bills and/or coins commensurate with the value of the ticket. In such embodiments, the redemption machine is coupled to the ticket tracking system which keeps track of the tickets in the same manner as described above.

As explained in connection with FIG. 15, the system described in FIG. 16 is not limited to the casino environment, but other environments such as a retailer and

amusement park environments, for example, are contemplated. In addition, in some embodiments, the ticket tracking system 1516 of FIG. 15 may be incorporated into or a part of the accounting system 1514, or vice versa. In other embodiments, the ticket tracking system 1608 of FIG. 16 may be incorporated into or a part of the accounting system 1606, or vice versa.

In addition to the embodiments described above or in the accompanying claims, several embodiments of the present invention will now be described.

#### ALTERNATIVE EMBODIMENT A

- 10 A. A document processing device, comprising:
- an input receptacle adapted to receive currency bills and substitute currency media, at least one of the substitute currency media having at least a first barcode pattern and a second barcode pattern disposed thereon;
  - at least one output receptacle adapted to receive currency bills and substitute  
15 currency media after the currency bills and substitute currency media have been evaluated;
  - a transport mechanism adapted to transport the currency bills and substitute currency media, one at a time, from the input receptacle to the at least one output receptacle along a transport path;
  - 20 an evaluation unit comprising at least one currency detector disposed along the transport path between the input receptacle and the output receptacle, the at least one currency detector being capable of evaluating currency bills, and a first media detector disposed along the transport path between the input receptacle and the output receptacle, the first media detector being  
25 capable of detecting the first barcode pattern and the second barcode pattern; and
  - a controller coupled to the evaluation unit, the controller being adapted to control the operation of the transport mechanism and the operation of the evaluation unit.

**ALTERNATIVE EMBODIMENT B**

B. The document processing device according to embodiment A, wherein the first barcode pattern and the second barcode pattern are on the same surface of the at least one of the substitute currency media.

**5 ALTERNATIVE EMBODIMENT C**

C. The document processing device according to embodiment A, wherein the first barcode pattern and the second barcode pattern are on opposite surfaces of the at least one of the substitute currency media.

**ALTERNATIVE EMBODIMENT D**

- 10 D. The document processing device according to any of embodiments A-C, wherein the first barcode pattern represents identification information.

**ALTERNATIVE EMBODIMENT E**

E. The document processing device according to embodiment D, wherein the identification information is a ticket number.

**15 ALTERNATIVE EMBODIMENT F**

F. The document processing device according to any of embodiments A-E, wherein the second barcode pattern represents a value.

**ALTERNATIVE EMBODIMENT G**

- 20 G. The document processing device according to embodiment F, wherein the value is an amount of currency.

**ALTERNATIVE EMBODIMENT H**

H. The document processing device according to any of embodiments A-G, wherein the first barcode pattern and the second barcode pattern are encoded according to the same barcode symbology.

**25 ALTERNATIVE EMBODIMENT I**

I. The document processing device according to any of embodiments A-G, wherein the first barcode pattern is encoded according to a first barcode symbology and the second barcode pattern is encoded according to a second barcode symbology.

**ALTERNATIVE EMBODIMENT J**

- 30 J. The document processing device according to any of embodiments A-I, wherein the media detector includes a barcode reader.

**ALTERNATIVE EMBODIMENT K**

K. The document processing device according to any of embodiments A-J, wherein the media detector includes at least a first barcode reader and a second barcode reader.

**ALTERNATIVE EMBODIMENT L**

- 5 L. The document processing device according to embodiment K, wherein the first barcode reader and the second barcode reader are disposed on the same side of the transport path.

**ALTERNATIVE EMBODIMENT M**

- 10 M. The document processing device according to embodiment L, wherein the first barcode reader and the second barcode reader are disposed on opposite sides of the transport path.

**ALTERNATIVE EMBODIMENT N**

- 15 N. The document processing device according to embodiment A, wherein the currency bills and substitute currency media are transported along the transport path at a rate of at least 1000 documents per minute, 1200 documents per minute, or 1600 documents per minute.

**ALTERNATIVE EMBODIMENT O**

- 20 O. The document processing device according to embodiment A, wherein the currency detector includes at least one of an optical scan head, a magnetic sensor, a size-detection sensor, a density sensor, a thread sensor, an infrared sensor, an ultraviolet scan head, a fluorescent scan head, and a full image scanner.

**ALTERNATIVE EMBODIMENT P**

- 25 P. The document processing device according to embodiment A, wherein the substitute currency media includes at least one of casino script, casino cashout tickets, retailer coupons, and gift certificates.

**ALTERNATIVE EMBODIMENT Q**

Q. The document processing device according to embodiment P, wherein the at least one substitute currency media further includes a third barcode pattern, the media detector being capable of detecting the third barcode pattern.

**ALTERNATIVE EMBODIMENT R**

R. The document processing device according to embodiment A, wherein the at least one output receptacle is exactly one output receptacle, two output receptacles, or eight output receptacles.

**5 ALTERNATIVE EMBODIMENT S**

S. The document processing device according to embodiment A, wherein the currency bills and substitute currency media are transported one at a time and in any order from the input receptacle to the at least one output receptacle along a transport path.

**10 ALTERNATIVE EMBODIMENT T**

T. A document processing device, comprising:

an input receptacle adapted to receive currency bills and substitute currency media, at least one of the substitute currency media including at least a first barcode pattern representative of a ticket number and a second barcode pattern representative of a value;

15 at least one output receptacle adapted to receive currency bills and substitute currency media after the currency bills and substitute currency media have been evaluated;

20 a transport mechanism adapted to transport the currency bills and substitute currency media, one at a time, from the input receptacle to the at least one output receptacle along a transport path;

an evaluation unit comprising at least one currency detector disposed along the transport path between the input receptacle and the output receptacle, the at least one currency detector being capable of evaluating currency bills, 25 and a first media detector disposed along the transport path between the input receptacle and the output receptacle, the first media detector being capable of detecting the first barcode pattern and the second barcode pattern;

30 a controller coupled to the evaluation unit, the controller being adapted to control the operation of the transport mechanism and the operation of the evaluation unit; and

a communications port coupled to the controller, the communications port being adapted to transmit at least one of the ticket number associated with the first barcode pattern and the value associated with the second barcode pattern.

5 **ALTERNATIVE EMBODIMENT U**

U. The document processing device according to embodiment T, wherein the controller is further adapted to save the ticket number and the value to an export file.

**ALTERNATIVE EMBODIMENT V**

V. The document processing device according to embodiment U, wherein the  
10 communications port is further adapted to transmit the export file to another system.

**ALTERNATIVE EMBODIMENT W**

W. An apparatus for processing both currency bills and substitute currency media, comprising:  
15 an input receptacle adapted to receive currency bills and substitute currency media, each of the substitute currency media including at least a first barcode pattern encoding a number and a second barcode pattern encoding a value associated with the number;  
at least one output receptacle adapted to receive currency bills and substitute  
20 currency media after the currency bills and substitute currency media have been evaluated;  
a transport mechanism adapted to transport the currency bills and substitute currency media, one at a time, from the input receptacle to the at least one output receptacle along a transport path;  
25 an evaluation unit comprising at least one detector disposed along the transport path between the input receptacle and the output receptacle, the at least one detector being capable of evaluating currency bills and of decoding the number encoded in the first barcode pattern and the value encoded in the second barcode pattern on each of the substitute currency media, one  
30 of the substitute currency media on which a number and a value are decoded being termed a valid substitute currency medium; and

a controller coupled to the evaluation unit, the controller being adapted to control the operation of the transport mechanism and the operation of the evaluation unit, the controller including a memory, the memory being adapted to store the number and the value of each valid substitute currency medium decoded by the detector.

#### **ALTERNATIVE EMBODIMENT X**

X. The document processing device according to embodiment W, wherein the at least one detector is a full image scanner.

#### **ALTERNATIVE EMBODIMENT Y**

Y. The document processing device according to embodiment W wherein the detector includes a currency detector and a barcode reader.

#### **ALTERNATIVE EMBODIMENT Z**

Z. The document processing device according to embodiment W, wherein the detector includes a currency detector and a barcode reader.

#### **ALTERNATIVE EMBODIMENT AA**

AA. The document processing device according to embodiment W, wherein the controller is adapted to save the contents of the memory to a storage medium.

#### **ALTERNATIVE EMBODIMENT AB**

AB. The document processing device according to embodiment AA, wherein the storage medium is a hard drive, a network drive, or a floppy disk.

#### **ALTERNATIVE EMBODIMENT AC**

AC. The document processing device according to embodiment W, further comprising a communications port coupled to the controller, the communications port being adapted to transmit at least a portion of the contents of the memory to another system.

#### **ALTERNATIVE EMBODIMENT AD**

AD. The document processing device according to embodiment W, further comprising a communications port coupled to the controller, the communications port being adapted to transmit the number and the value of at least one valid substitute currency medium decoded by the decoder to another system.

**ALTERNATIVE EMBODIMENT AE**

AE. The document processing device according to embodiment W, wherein the value is an amount of currency.

**ALTERNATIVE EMBODIMENT AF**

- 5 AF. An evaluation unit for evaluating currency bills and barcoded tickets in a document processing device, comprising:

a first detector adapted to detect characteristic information of a currency bill;

a second detector adapted to detect at least two barcode patterns on a barcoded ticket that is redeemable for cash; and

- 10 a controller coupled to said second detector adapted to decode the at least two barcode patterns into a set of characters identifying a particular one of the barcoded tickets and a number representing an amount of currency, the particular one of the barcoded tickets being termed a valid barcoded ticket.

15 **ALTERNATIVE EMBODIMENT AG**

AG. The document processing device according to embodiment AF, wherein the set of characters is a barcoded ticket number.

**ALTERNATIVE EMBODIMENT AH**

- 20 AH. The document processing device according to embodiment AF, wherein the at least two barcode patterns are encoded according to the same barcode symbology.

**ALTERNATIVE EMBODIMENT AI**

AI. The document processing device according to embodiment AH, wherein the second detector includes a barcode reader adapted to decode the at least two barcode patterns.

25 **ALTERNATIVE EMBODIMENT AJ**

AJ. The document processing device according to embodiment AF, wherein the at least two barcode patterns are encoded according to different barcode symbologies.

**ALTERNATIVE EMBODIMENT AK**

- 30 AK. The document processing device according to embodiment AJ, wherein the second detector includes a first barcode reader adapted to decode one of the at least two



barcode patterns and a second barcode reader adapted to decode a second one of the at least two barcode patterns.

#### **ALTERNATIVE EMBODIMENT AL**

AL. The document processing device according to embodiment AF, wherein the  
5 characteristic information includes at least one of size, thickness, color, magnetism, reflectivity, absorbability, transmissivity, electrical conductivity, and serial number.

#### **ALTERNATIVE EMBODIMENT AM**

AM. The document processing device according to embodiment AF, wherein the  
characteristic information includes at least one of size, thickness, color, magnetism,  
10 reflectivity, absorbability, transmissivity, electrical conductivity, and serial number.

#### **ALTERNATIVE EMBODIMENT AN**

AN. The document processing device according to embodiment AF, wherein the first  
detector includes at least one of an optical scan head, a magnetic sensor, a size-detection  
sensor, a density sensor, a thread sensor, an infrared sensor, an ultraviolet scan head, a  
15 fluorescent light scan head, and a full image scanner.

#### **ALTERNATIVE EMBODIMENT AO**

AO. A method of processing both currency bills and substitute currency media in a  
document processing device, the method comprising:

receiving a stack of documents including currency bills and substitute currency  
20 media to be evaluated in an input receptacle of the device;  
transporting each of the documents, one document at a time, past a currency  
detector and past a media detector;  
scanning each document to obtain characteristic information associated with a  
currency bill;  
25 scanning each document to obtain characteristic information associated with a  
substitute currency medium, the characteristic information including a  
first barcode pattern and a second barcode pattern;  
determining whether each document meets or fails at least one criterion; and  
directing each document to at least one output receptacle based on the step of  
30 determining.

**ALTERNATIVE EMBODIMENT AP**

AP. The method according to embodiment AO, further comprising:  
decoding the first barcode pattern into a ticket number; and  
decoding the second barcode pattern into an amount of currency.

5 **ALTERNATIVE EMBODIMENT AQ**

AQ. The method according to embodiment AO, further comprising:  
storing the characteristic information associated with the currency bill in a storage  
medium; and  
storing the characteristic information associated with the substitute currency  
10 medium in a storage medium.

**ALTERNATIVE EMBODIMENT AR**

AR. The method according to embodiment AO, wherein the characteristic information  
associated with the currency bill is a ticket number and the characteristic information  
associated with the substitute currency medium is a value, the method further comprising  
15 transmitting the ticket number and the value to a system.

**ALTERNATIVE EMBODIMENT AS**

AS. The method according to embodiment AR, wherein the system is an accounting  
system, the method further comprising reconciling the ticket numbers and the values  
obtained by the document processing device with ticket numbers and values stored in the  
20 accounting system.

**ALTERNATIVE EMBODIMENT AT**

AT. A method of processing documents, comprising:  
accepting a plurality of documents including substitute currency media into an  
input receptacle of a document processing device, each of the substitute  
25 currency media including more than one barcode pattern thereon;  
transporting each of the documents, one document at a time, past a detector;  
scanning each document via the detector for at least a first barcode pattern and a  
second barcode pattern, a document having a decodable first barcode  
pattern and a decodable second barcode pattern being termed a valid  
30 substitute currency medium;

- first decoding for each valid substitute currency medium the first barcode pattern into a first set of characters representing identification information;  
second decoding for each valid substitute currency medium the second barcode pattern into a second set of characters representing an amount of currency;  
5 and  
directing each document to at least one output receptacle.

**ALTERNATIVE EMBODIMENT AU**

AU. The method according to embodiment AT, wherein the steps of first decoding and second decoding are both carried out by a barcode reader.

10 **ALTERNATIVE EMBODIMENT AV**

AV. The method according to embodiment AT, wherein the step of first decoding is carried out by a first barcode reader and the step of second decoding is carried out by a second barcode reader, the first barcode reader being adapted to decode a barcode symbology different from that of the second barcode reader.

15 **ALTERNATIVE EMBODIMENT AW**

AW. The method according to embodiment AT, further comprising adding the amount of currency to a running total and storing the running total after a last one of the plurality of documents has been processed.

**ALTERNATIVE EMBODIMENT AX**

- 20 AX. The method according to embodiment AT, wherein the identification information includes a ticket number, the method further comprising storing the ticket number of each valid substitute currency medium in a file and providing the file to a ticket tracking system.

**ALTERNATIVE EMBODIMENT AY**

- 25 AY. The method according to embodiment AX, wherein the providing is carried out over a network.

**ALTERNATIVE EMBODIMENT AZ**

AZ. The method according to embodiment AT, wherein the providing is carried out via a floppy disk.

**ALTERNATIVE EMBODIMENT BA**

- BA. The method according to embodiment AT, wherein the identification information includes a ticket number, the method further comprising storing the ticket number and the amount of currency of each valid substitute currency medium in a file and providing
- 5 the file to an accounting system.

**ALTERNATIVE EMBODIMENT BB**

BB. The method according to embodiment AT, wherein the plurality of documents include currency bills.

**ALTERNATIVE EMBODIMENT BC**

- 10 BC. The method according to embodiment AT, wherein the plurality of documents include a batch identification card bearing encoded information identifying the document processing device.

**ALTERNATIVE EMBODIMENT BD**

- BD. A method of processing a stack of documents including currency bills and
- 15 substitute currency media, comprising:

receiving a plurality of documents including currency bills and substitute currency media into an input receptacle of a document processing device, each of the substitute currency media including a first barcode pattern and a second barcode pattern;

- transporting each of the documents, one document at a time, past a barcode
- 20 reader;

identifying whether a document is a substitute currency medium, the document so identified being termed a barcoded document;

first scanning via the barcode reader the barcoded document for the first barcode pattern;

- 25 second scanning via the barcode reader the barcoded document for the second barcode pattern; and

directing each document to one or more output receptacles.

**ALTERNATIVE EMBODIMENT BE**

- BE. A method of processing documents in a document processing device, comprising:
- 30 first decoding a first barcode pattern on a document into a number; and

second decoding a second barcode pattern on the document into a value representative of an amount of currency.

#### **ALTERNATIVE EMBODIMENT BF**

BF. A document processing device in a system having a plurality of machines adapted to accept documents, the plurality of machines being coupled to an accounting system, the document processing device comprising:

- an input receptacle adapted to receive a stack of documents including currency bills and substitute currency media, each of the substitute currency media including at least a first barcode pattern encoding a number and a second barcode pattern encoding a value;
- at least one output receptacle adapted to receive the stack of documents after the currency bills and substitute currency media have been evaluated;
- a transport mechanism adapted to transport the currency bills and substitute currency media, one at a time, from the input receptacle to the at least one output receptacle along a transport path;
- an evaluation unit comprising at least one detector disposed along the transport path between the input receptacle and the output receptacle, the at least one detector being capable of evaluating currency bills and of decoding the number encoded in the first barcode pattern and the value encoded in the second barcode pattern on each of the substitute currency media; and
- a controller coupled to the evaluation unit, the controller being adapted to control the operation of the transport mechanism and the operation of the evaluation unit, the controller further being adapted to store the number and the value of each substitute currency medium to a file.

#### **ALTERNATIVE EMBODIMENT BG**

BG. The document processing device according to embodiment BF in combination with an accounting system, the accounting system being adapted to reconcile the number and the value of each substitute currency medium in the file with pre-processed document data.

**ALTERNATIVE EMBODIMENT BH**

BH. The document processing device according to embodiment BF, further comprising a communications port coupled to the controller, the communications port being adapted to transmit the file to the accounting system.

**5 ALTERNATIVE EMBODIMENT BI**

BI. The document processing device according to embodiment BF, wherein the file is stored on a removable storage media.

**ALTERNATIVE EMBODIMENT BJ**

- BJ. A method of processing documents, comprising the steps of:
- 10 generating pre-processed document data indicative of characteristic information of currency bills and substitute currency media received and dispensed by a document accepting device, the substitute currency media having a first barcode pattern encoding a number and a second barcode pattern encoding a value;
- processing the currency bills and substitute currency media in a document
- 15 processing device;
- first decoding, in the document processing device, the first barcode pattern on each substitute currency media into the number;
- second decoding, in the document processing device, the second barcode pattern on each substitute currency media into the value;
- 20 providing the number and the value of each substitute currency media to an accounting system; and
- reconciling in the accounting system the number and the value of each substitute currency media with the pre-processed document data.

**ALTERNATIVE EMBODIMENT BK**

- 25 BK. The method according to embodiment BJ, wherein the providing is carried out by storing the number and the value of each substitute currency media to a file and transmitting the file to the accounting system.

**ALTERNATIVE EMBODIMENT BL**

- BL. The method according to embodiment BJ, wherein the providing is carried out by
- 30 storing the number and the value of each substitute currency media to a removable storage medium and providing the removable storage medium to the accounting system.

**ALTERNATIVE EMBODIMENT BM**

BM. The method according to any of embodiments BJ-BL, further comprising:

providing the number of each substitute currency media from the accounting system to a media tracking system; and

- 5 retrieving a value from the media tracking system corresponding to the number.

**ALTERNATIVE EMBODIMENT BN**

BN. A system for processing documents, comprising:

at least one document accepting device;

- at least one document processing device coupled to the at least one document  
10 accepting device, the at least one document processing device being adapted to process a stack of documents including currency bills and substitute currency media having at least a first barcode pattern indicative of a number and a second barcode pattern indicative of a value; and

- an accounting system coupled to the at least one document processing device, the  
15 accounting system being adapted to reconcile the number and the ticket of each substitute currency media with pre-processed document data.

**ALTERNATIVE EMBODIMENT BO**

BO. The system according to embodiment BN, further comprising:

- a tracking system coupled to the accounting system, the tracking system being  
20 adapted to store identification information associated with substitute currency media and values corresponding to the identification information.

**ALTERNATIVE EMBODIMENT BP**

- BP. The system according to any of embodiments BN-BO, wherein the document processing device includes at least one detector disposed along a transport path between  
25 an input receptacle and at least one output receptacle, the at least one detector being capable of evaluating currency bills and of decoding the number associated with the first barecode pattern and of decoding the value associated with the second barecode pattern.

**ALTERNATIVE EMBODIMENT BQ**

- BQ. The system according to embodiment BP, wherein the at least one detector  
30 includes an imaging camera.

**ALTERNATIVE EMBODIMENT BR**

BR. The system according to embodiment BP, wherein the at least one detector includes a full image seanner.

**ALTERNATIVE EMBODIMENT BS**

- 5 BS. The system according to embodiment BP, wherein the at least one detector includes a currency detector and at least one barcode reader.

**ALTERNATIVE EMBODIMENT BT**

- BT. The system according to any of embodiments BN-BS, wherein the document processing device includes a removable media drive adapted to accept a removable  
10 media on which at least the number and the value of each substitute currency media is stored.

**ALTERNATIVE EMBODIMENT BU**

- BU. The system according to any of embodiments BN-BT, wherein the document processing device includes a communications port adapted to transmit at least the  
15 number and the value of each substitute currency media to the accounting system.

**ALTERNATIVE EMBODIMENT BV**

BV. The system according to any of embodiments BN-BU, wherein the accounting system includes a tracking system.

**ALTERNATIVE EMBODIMENT BW**

- 20 BW. The system according to any of embodiments BN-BV, wherein the document accepting device is a gaming machine.

**ALTERNATIVE EMBODIMENT BX**

BX. The system according to any of embodiments BN-BV, wherein the document accepting device is a redemption machine.

- 25 While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and herein described in detail. It should be understood, however, that it is not intended to limit the invention to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope  
30 of the invention as defined by the appended claims.



**CLAIMS:**

1. A document processing device, comprising:  
an input receptacle adapted to receive currency bills and substitute currency media, at least one of the substitute currency media having at least a first  
5 barcode pattern and a second barcode pattern disposed thereon;  
at least one output receptacle adapted to receive currency bills and substitute currency media after the currency bills and substitute currency media have been evaluated;  
a transport mechanism adapted to transport the currency bills and substitute  
10 currency media, one at a time, from the input receptacle to the at least one output receptacle along a transport path;  
an evaluation unit comprising at least one currency detector disposed along the transport path between the input receptacle and the output receptacle, the at least one currency detector being capable of evaluating currency bills,  
15 and a first media detector disposed along the transport path between the input receptacle and the output receptacle, the first media detector being capable of detecting the first barcode pattern and the second barcode pattern; and  
a controller coupled to the evaluation unit, the controller being adapted to control  
20 the operation of the transport mechanism and the operation of the evaluation unit.
2. The document processing device of claim 1, wherein the first barcode pattern and the second barcode pattern are on the same surface of the at least one of the substitute currency media.
- 25 3. The document processing device of claim 1, wherein the first barcode pattern and the second barcode pattern are on opposite surfaces of the at least one of the substitute currency media.
4. The document processing device of claim 1, wherein the first barcode pattern represents identification information.

5. The document processing device of claim 4, wherein the identification information is a ticket number.
6. The document processing device of claim 1, wherein the second barcode pattern represents a value.
- 5 7. The document processing device of claim 6, wherein the value is an amount of currency.
8. The document processing device of claim 1, wherein the first barcode pattern and the second barcode pattern are encoded according to the same barcode symbology.
- 10 9. The document processing device of claim 1, wherein the first barcode pattern is encoded according to a first barcode symbology and the second barcode pattern is encoded according to a second barcode symbology.
10. The document processing device of claim 1, wherein the media detector includes a barcode reader.
- 15 11. The document processing device of claim 1, wherein the media detector includes at least a first barcode reader and a second barcode reader.
12. The document processing device of claim 11, wherein the first barcode reader and the second barcode reader are disposed on the same side of the transport path.
13. The document processing device of claim 11, wherein the first barcode reader and the second barcode reader are disposed on opposite sides of the transport path.
- 20 14. The document processing device of claim 1, wherein the currency bills and substitute currency media are transported along the transport path at a rate of at least 1000 documents per minute.
15. The document processing device of claim 1, wherein the currency bills and substitute currency media are transported along the transport path at a rate of at least 1200 documents per minute.
- 25 16. The document processing device of claim 1, wherein the currency bills and substitute currency media are transported along the transport path at a rate of at least 1600 documents per minute.
- 30 17. The document processing device of claim 1, wherein the currency detector includes at least one of an optical scan head, a magnetic sensor, a size-detection

sensor, a density sensor, a thread sensor, an infrared sensor, an ultraviolet scan head, a fluorescent scan head, and a full image scanner.

18. The document processing device of claim 1, wherein the substitute currency media includes at least one of casino script, casino cashout tickets, retailer coupons, and gift certificates.
19. The document processing device of claim 1, wherein the at least one substitute currency media further includes a third barcode pattern, the media detector being capable of detecting the third barcode pattern.
20. The document processing device of claim 1, wherein the at least one output receptacle is exactly one output receptacle.
21. The document processing device of claim 1, wherein the at least one output receptacle is at least two output receptacles.
22. The document processing device of claim 1, wherein the at least one output receptacle is at least eight output receptacles.
23. The document processing device of claim 1, wherein the currency bills and substitute currency media are transported one at a time and in any order from the input receptacle to the at least one output receptacle along a transport path.
24. A document processing device, comprising:
  - an input receptacle adapted to receive currency bills and substitute currency media, at least one of the substitute currency media including at least a first barcode pattern representative of a ticket number and a second barcode pattern representative of a value;
  - at least one output receptacle adapted to receive currency bills and substitute currency media after the currency bills and substitute currency media have been evaluated;
  - a transport mechanism adapted to transport the currency bills and substitute currency media, one at a time, from the input receptacle to the at least one output receptacle along a transport path;
  - an evaluation unit comprising at least one currency detector disposed along the transport path between the input receptacle and the output receptacle, the at least one currency detector being capable of evaluating currency bills,

- and a first media detector disposed along the transport path between the input receptacle and the output receptacle, the first media detector being capable of detecting the first barcode pattern and the second barcode pattern;
- 5 a controller coupled to the evaluation unit, the controller being adapted to control the operation of the transport mechanism and the operation of the evaluation unit; and
- a communications port coupled to the controller, the communications port being adapted to transmit at least one of the ticket number associated with the first barcode pattern and the value associated with the second barcode pattern.
- 10 25. The document processing device of claim 24, wherein the controller is further adapted to save the ticket number and the value to an export file.
26. The document processing device of claim 25, wherein the communications port is further adapted to transmit the export file to another system.
- 15 27. An apparatus for processing both currency bills and substitute currency media, comprising:
- an input receptacle adapted to receive currency bills and substitute currency media, each of the substitute currency media including at least a first
- 20 barcode pattern encoding a number and a second barcode pattern encoding a value associated with the number;
- at least one output receptacle adapted to receive currency bills and substitute currency media after the currency bills and substitute currency media have been evaluated;
- 25 a transport mechanism adapted to transport the currency bills and substitute currency media, one at a time, from the input receptacle to the at least one output receptacle along a transport path;
- an evaluation unit comprising at least one detector disposed along the transport path between the input receptacle and the output receptacle, the at least one detector being capable of evaluating currency bills and of decoding the number encoded in the first barcode pattern and the value encoded in
- 30

- the second barcode pattern on each of the substitute currency media, one of the substitute currency media on which a number and a value are decoded being termed a valid substitute currency medium; and
- a controller coupled to the evaluation unit, the controller being adapted to control
- 5 the operation of the transport mechanism and the operation of the evaluation unit, the controller including a memory, the memory being adapted to store the number and the value of each valid substitute currency medium decoded by the detector.
28. The document processing device of claim 27, wherein the at least one detector is
- 10 a full image scanner.
29. The document processing device of claim 27, wherein the detector includes a currency detector and a barcode reader.
30. The document processing device of claim 27, wherein the detector includes a currency detector and a barcode reader.
- 15 31. The document processing device of claim 27, wherein the controller is adapted to save the contents of the memory to a storage medium.
32. The document processing device of claim 31, wherein the storage medium is a hard drive.
33. The document processing device of claim 31, wherein the storage medium is a
- 20 network drive.
34. The document processing device of claim 31, wherein the storage medium is a floppy disk.
35. The document processing device of claim 27, further comprising a communications port coupled to the controller, the communications port being
- 25 adapted to transmit at least a portion of the contents of the memory to another system.
36. The document processing device of claim 27, further comprising a communications port coupled to the controller, the communications port being adapted to transmit the number and the value of at least one valid substitute
- 30 currency medium decoded by the decoder to another system.

37. The document processing device of claim 27, wherein the value is an amount of currency.
38. An evaluation unit for evaluating currency bills and barcoded tickets in a document processing device, comprising:
- 5 a first detector adapted to detect characteristic information of a currency bill;  
a second detector adapted to detect at least two barcode patterns on a barcoded ticket that is redeemable for cash; and  
a controller coupled to said second detector adapted to decode the at least two barcode patterns into a set of characters identifying a particular one of the barcoded tickets and a number representing an amount of currency, the  
10 particular one of the barcoded tickets being termed a valid barcoded ticket.
39. The document processing device of claim 38, wherein the set of characters is a barcoded ticket number.
- 15 40. The document processing device of claim 38, wherein the at least two barcode patterns are encoded according to the same barcode symbology.
41. The document processing device of claim 40, wherein the second detector includes a barcode reader adapted to decode the at least two barcode patterns.
42. The document processing device of claim 38, wherein the at least two barcode patterns are encoded according to different barcode symbologies.
- 20 43. The document processing device of claim 42, wherein the second detector includes a first barcode reader adapted to decode one of the at least two barcode patterns and a second barcode reader adapted to decode a second one of the at least two barcode patterns.
- 25 44. The document processing device of claim 38, wherein the characteristic information includes at least one of size, thickness, color, magnetism, reflectivity, absorbability, transmissivity, electrical conductivity, and serial number.
45. The document processing device of claim 38, wherein the characteristic information includes at least one of size, thickness, color, magnetism, reflectivity,  
30 absorbability, transmissivity, electrical conductivity, and serial number.

46. The document processing device of claim 38, wherein the first detector includes at least one of an optical scan head, a magnetic sensor, a size-detection sensor, a density sensor, a thread sensor, an infrared sensor, an ultraviolet scan head, a fluorescent light scan head, and a full image scanner.
- 5 47. A document processing device in a system having a plurality of machines adapted to accept documents, the plurality of machines being coupled to an accounting system, the document processing device comprising:
- an input receptacle adapted to receive a stack of documents including currency bills and substitute currency media, each of the substitute currency media including at least a first barcode pattern encoding a number and a second barcode pattern encoding a value;
- 10 at least one output receptacle adapted to receive the stack of documents after the currency bills and substitute currency media have been evaluated;
- a transport mechanism adapted to transport the currency bills and substitute currency media, one at a time, from the input receptacle to the at least one output receptacle along a transport path;
- 15 an evaluation unit comprising at least one detector disposed along the transport path between the input receptacle and the output receptacle, the at least one detector being capable of evaluating currency bills and of decoding the number encoded in the first barcode pattern and the value encoded in the second barcode pattern on each of the substitute currency media; and
- 20 a controller coupled to the evaluation unit, the controller being adapted to control the operation of the transport mechanism and the operation of the evaluation unit, the controller further being adapted to store the number and the value of each substitute currency medium to a file.
- 25 48. The document processing device of claim 47 in combination with an accounting system, the accounting system being adapted to reconcile the number and the value of each substitute currency medium in the file with pre-processed document data.

49. The document processing device of claim 47, further comprising a communications port coupled to the controller, the communications port being adapted to transmit the file to the accounting system.
50. The document processing device of claim 47, wherein the file is stored on a removable storage media.
51. A method of processing both currency bills and substitute currency media in a document processing device, the method comprising:  
receiving a stack of documents including currency bills and substitute currency media to be evaluated in an input receptacle of the device;  
transporting each of the documents, one document at a time, past a currency detector and past a media detector;  
scanning each document to obtain characteristic information associated with a currency bill;  
scanning each document to obtain characteristic information associated with a substitute currency medium, the characteristic information including a first barcode pattern and a second barcode pattern;  
determining whether each document meets or fails at least one criterion; and  
directing each document to at least one output receptacle based on the step of determining.
52. The method of claim 51, further comprising:  
decoding the first barcode pattern into a ticket number; and  
decoding the second barcode pattern into an amount of currency.
53. The method of claim 51, further comprising:  
storing the characteristic information associated with the currency bill in a storage medium; and  
storing the characteristic information associated with the substitute currency medium in a storage medium.
54. The method of claim 51, wherein the characteristic information associated with the currency bill is a ticket number and the characteristic information associated with the substitute currency medium is a value, the method further comprising transmitting the ticket number and the value to a system.



55. The method of claim 54, wherein the system is an accounting system, the method further comprising reconciling the ticket numbers and the values obtained by the document processing device with ticket numbers and values stored in the accounting system.
- 5
56. A method of processing documents, comprising:
- accepting a plurality of documents including substitute currency media into an input receptacle of a document processing device, each of the substitute currency media including more than one barcode pattern thereon;
- 10 transporting each of the documents, one document at a time, past a detector; scanning each document via the detector for at least a first barcode pattern and a second barcode pattern, a document having a decodable first barcode pattern and a decodable second barcode pattern being termed a valid substitute currency medium;
- 15 first decoding for each valid substitute currency medium the first barcode pattern into a first set of characters representing identification information; second decoding for each valid substitute currency medium the second barcode pattern into a second set of characters representing an amount of currency; and
- 20 directing each document to at least one output receptacle.
57. The method of claim 56, wherein the steps of first decoding and second decoding are both carried out by a barcode reader.
58. The method of claim 56, wherein the step of first decoding is carried out by a first barcode reader and the step of second decoding is carried out by a second barcode reader, the first barcode reader being adapted to decode a barcode symbology different from that of the second barcode reader.
- 25
59. The method of claim 56, further comprising adding the amount of currency to a running total and storing the running total after a last one of the plurality of documents has been processed.
- 30 60. The method of claim 56, wherein the identification information includes a ticket number, the method further comprising storing the ticket number of each valid

substitute currency medium in a file and providing the file to a ticket tracking system.

61. The method of claim 60, wherein the providing is carried out over a network.

62. The method of claim 56, wherein the providing is carried out via a floppy disk.

5 63. The method of claim 56, wherein the identification information includes a ticket number, the method further comprising storing the ticket number and the amount of currency of each valid substitute currency medium in a file and providing the file to an accounting system.

64. The method of claim 56, wherein the plurality of documents include currency bills.  
10

65. The method of claim 56, wherein the plurality of documents include a batch identification card bearing encoded information identifying the document processing device.

66. A method of processing documents, comprising the steps of:  
15 generating pre-processed document data indicative of characteristic information of currency bills and substitute currency media received and dispensed by a document accepting device, the substitute currency media having a first barcode pattern encoding a number and a second barcode pattern encoding a value;

20 processing the currency bills and substitute currency media in a document processing device;

first decoding, in the document processing device, the first barcode pattern on each substitute currency media into the number;

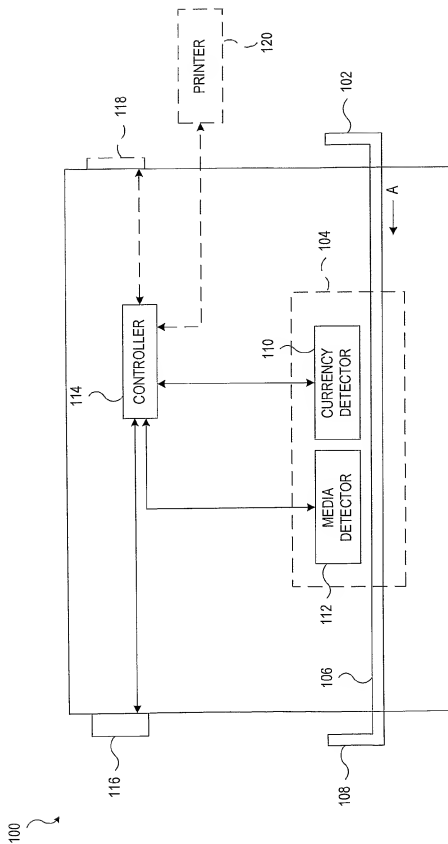
25 second decoding, in the document processing device, the second barcode pattern on each substitute currency media into the value;

providing the number and the value of each substitute currency media to an accounting system; and

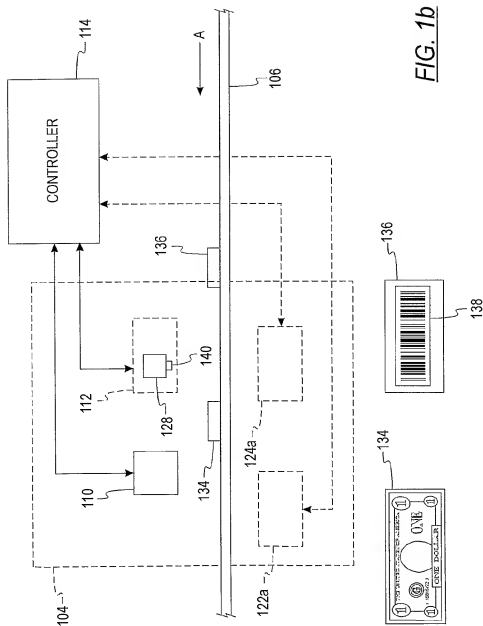
reconciling in the accounting system the number and the value of each substitute currency media with the pre-processed document data.

67. The method of claim 66, wherein the providing is carried out by storing the number and the value of each substitute currency media to a file and transmitting the file to the accounting system.
68. The method of claim 66, wherein the providing is carried out by storing the number and the value of each substitute currency media to a removable storage medium and providing the removable storage medium to the accounting system.
69. The method of claim 66, further comprising:  
providing the number of each substitute currency media from the accounting system to a media tracking system; and  
retrieving a value from the media tracking system corresponding to the number.

1/23

FIG. 1a

2/23



3/23

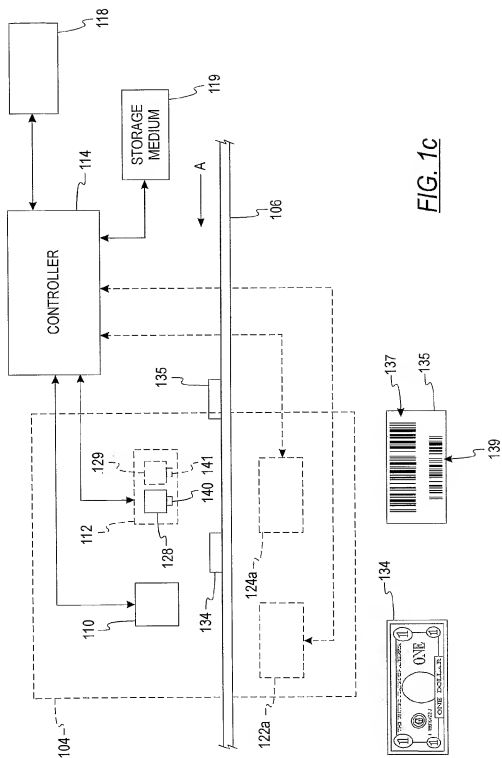
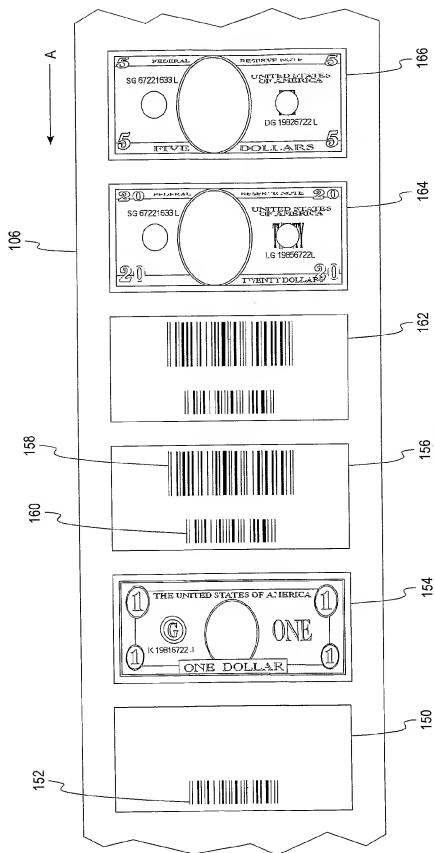
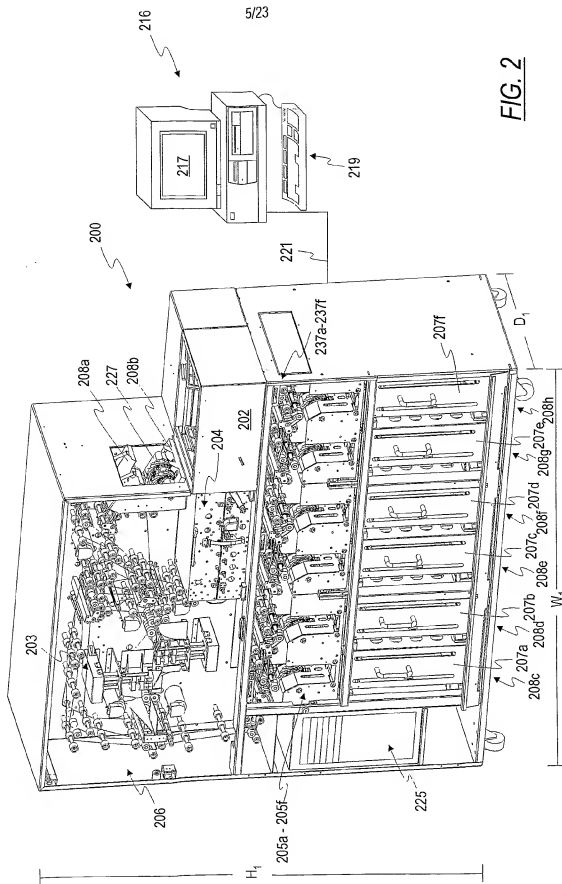


FIG. 1c

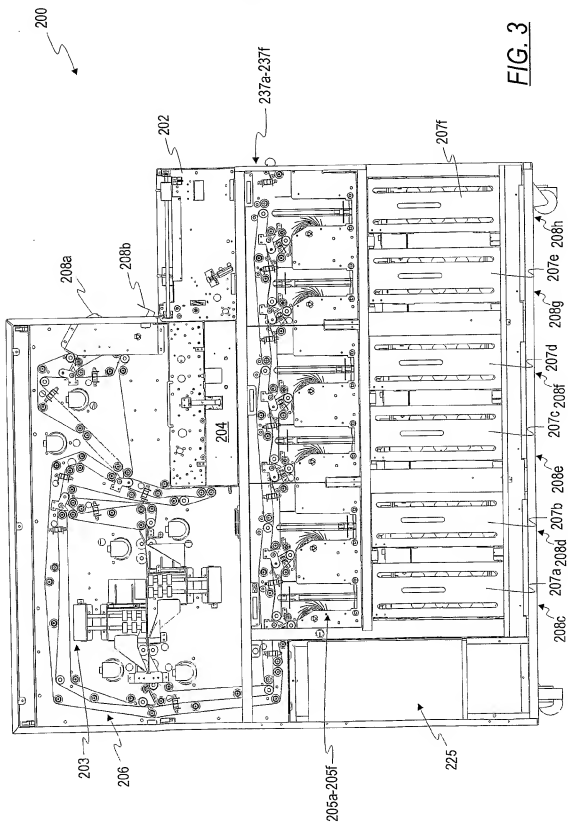
4/23

FIG. 1d

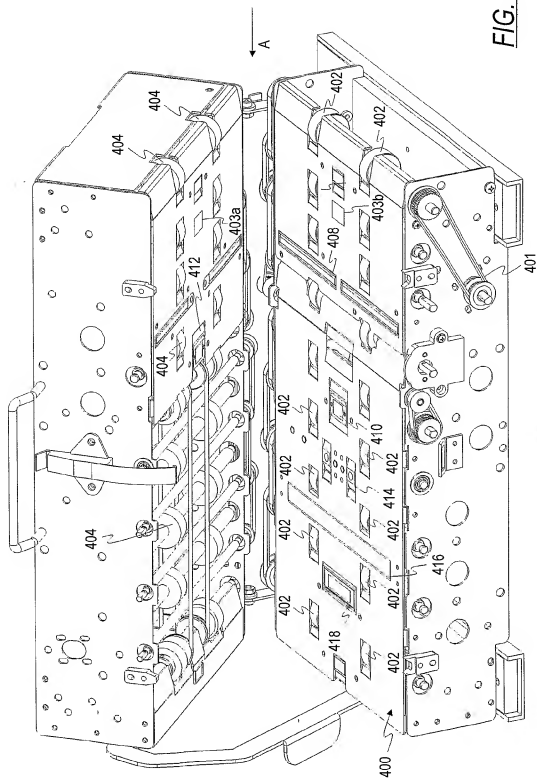




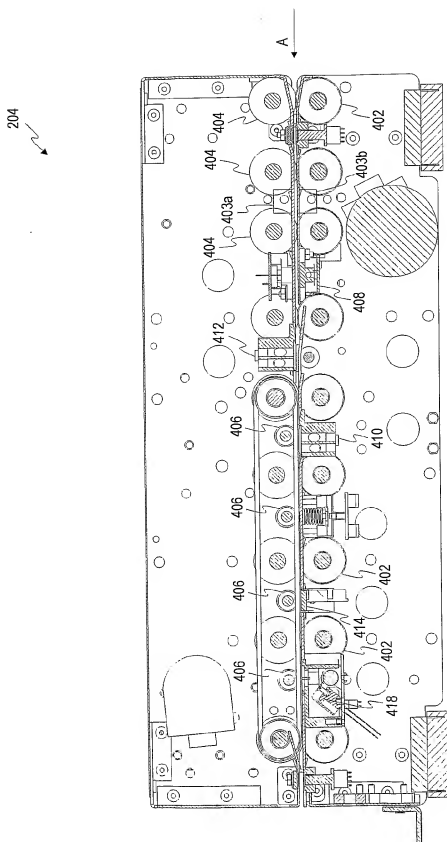
6/23



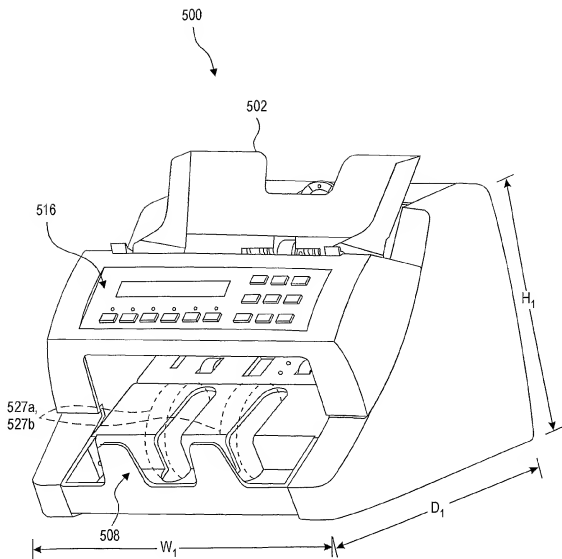
7/23



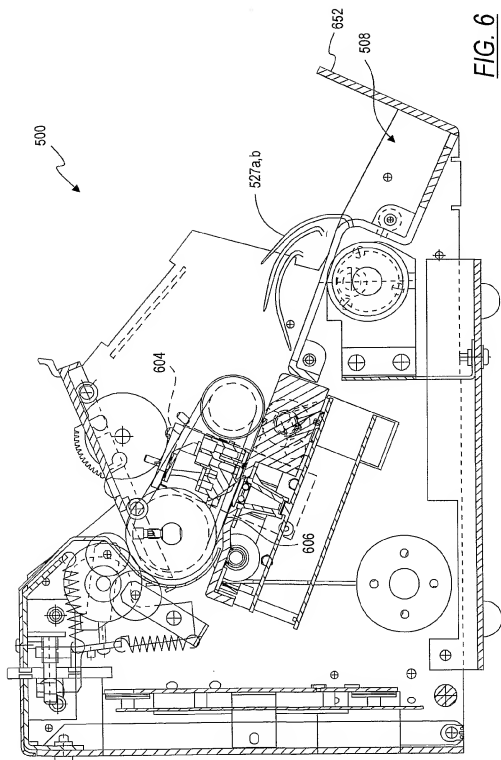
8/23



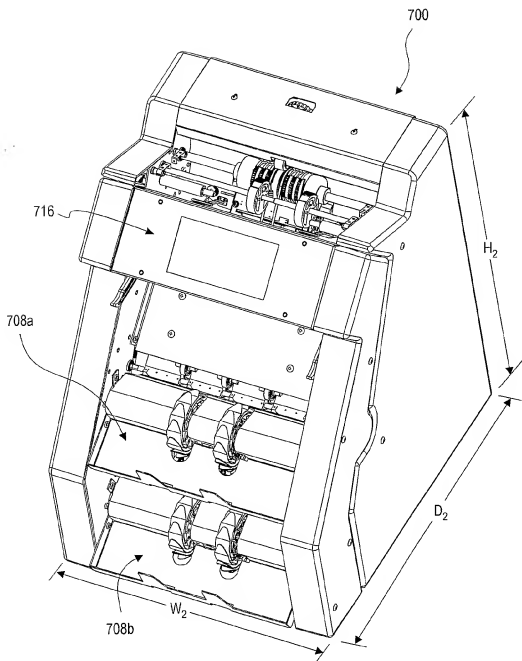
9/23

FIG. 5

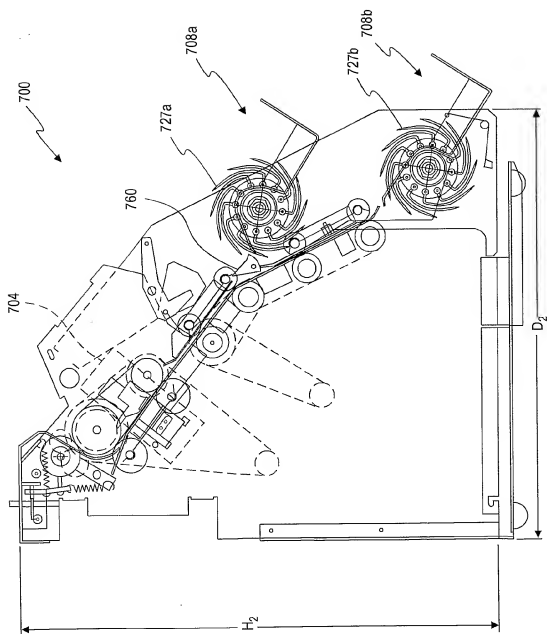
10/23



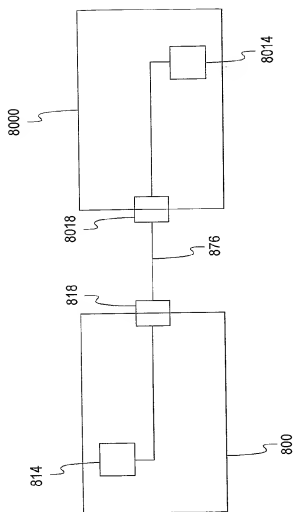
11/23

FIG. 7a

12/23

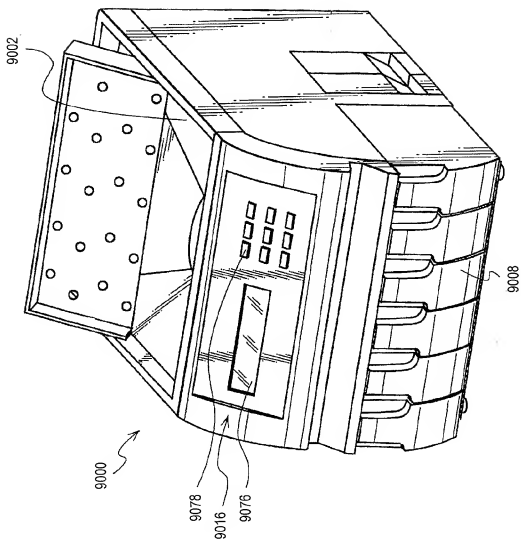
*FIG. 7b*

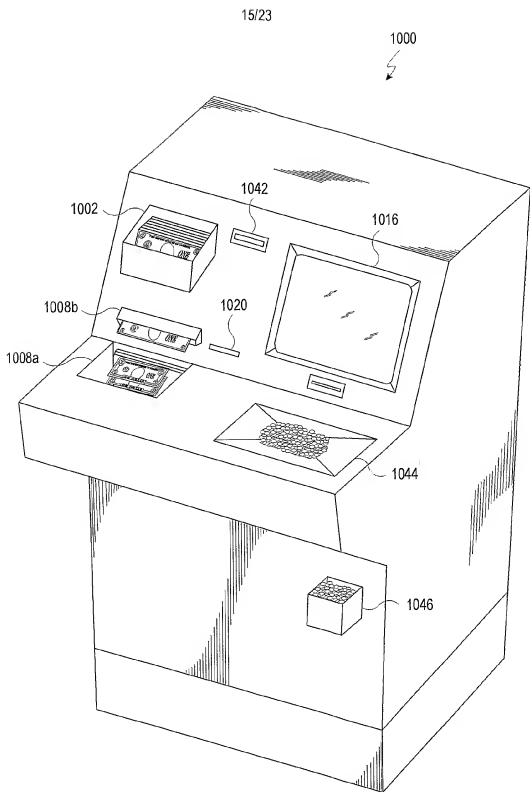
13/23

FIG. 8

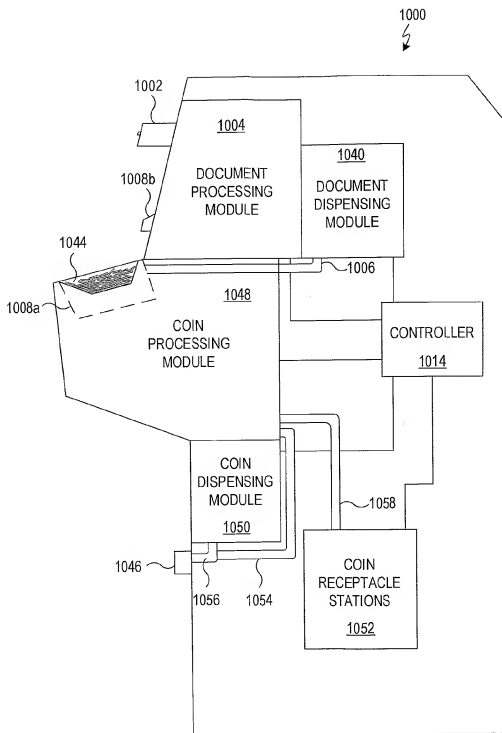


14/23

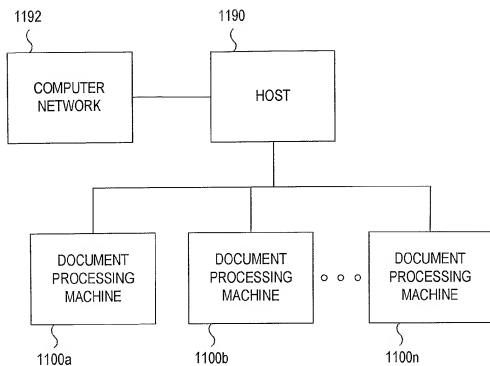
FIG. 9

FIG. 10a

16/23

*FIG. 10b*

17/23

FIG. 11

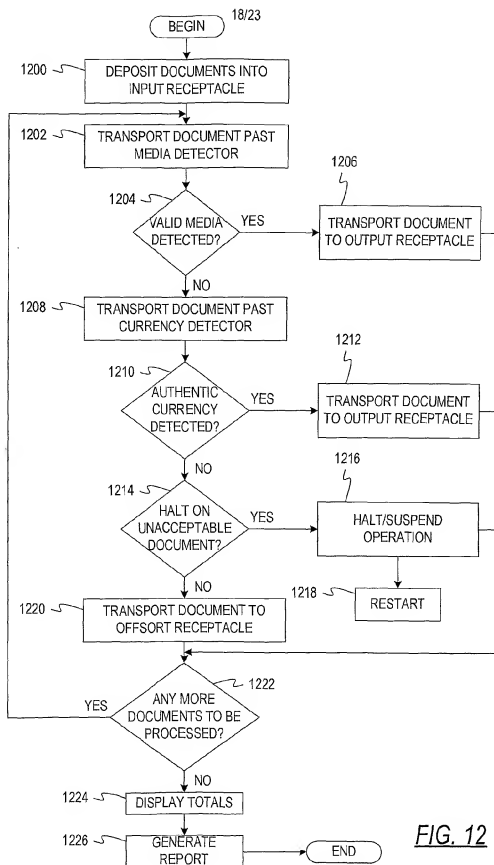
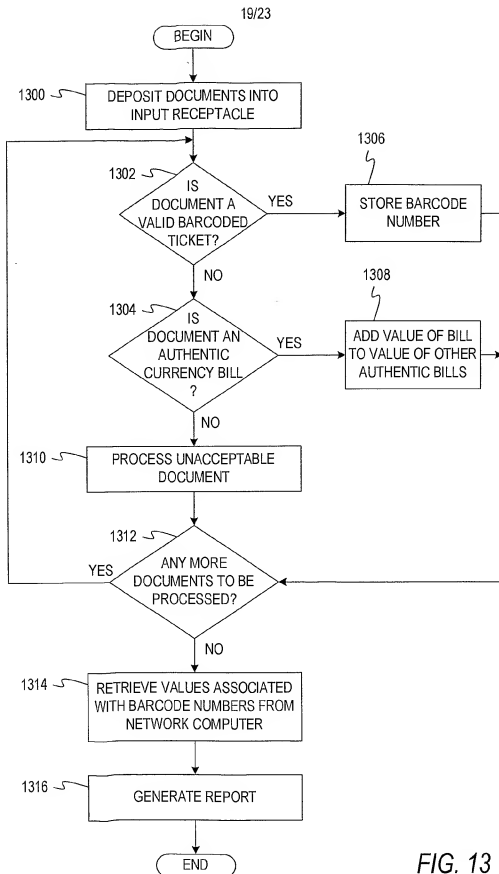
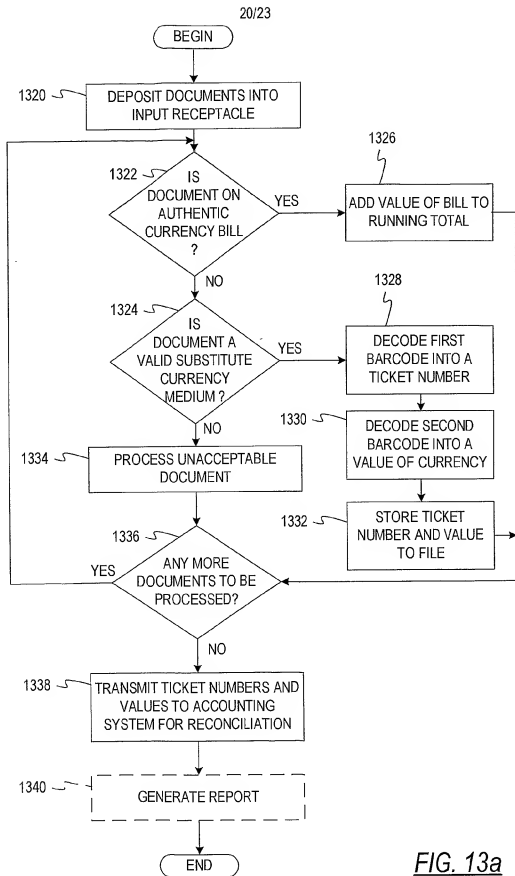
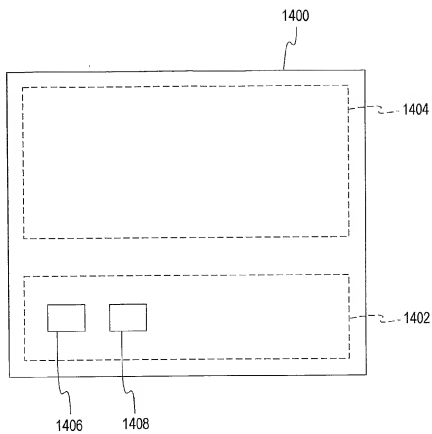


FIG. 12



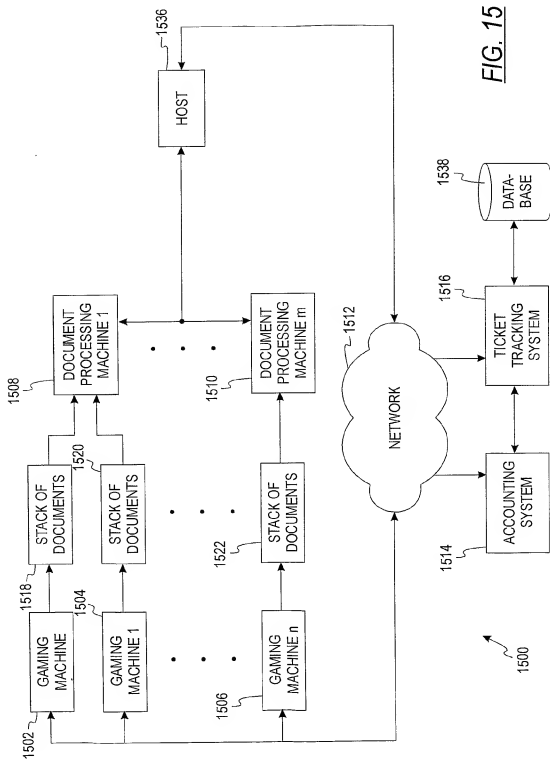


21/23

FIG. 14



22/23



23/23

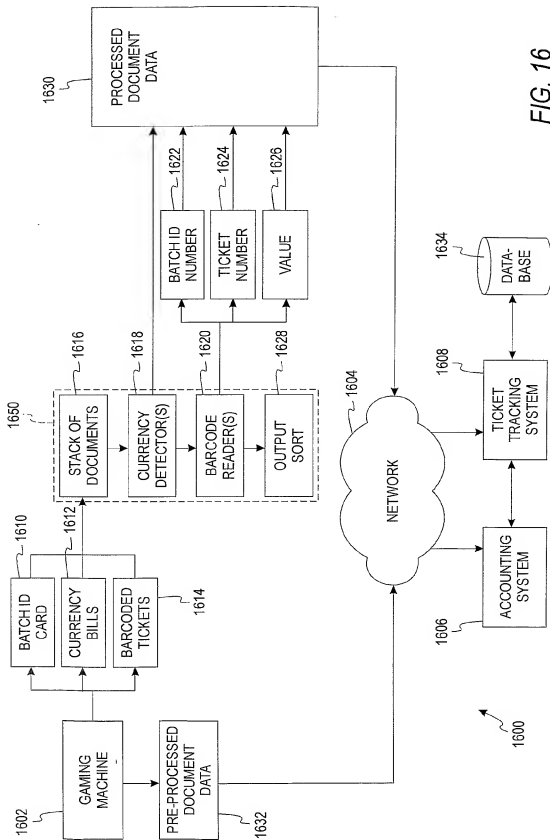


FIG. 16

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/19790

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : G06K 5/00, 13/00

US CL : 235/375, 381, 380, 379, 475, 476; 194/206, 207; 209/534

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 235/375, 381, 380, 379, 475, 476; 194/206, 207; 209/534

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NoneElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
None**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A, P	US 2003/0062242 A1 (Hallowell et al.) 03 April 2003 (03.04.2003), the entire reference	1-69
A, P	US 2003/0015395 A1 (Hallowell et al.) 23 January 2003 (23.03.2003), the entire reference	1-69

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application of patent published on or after the international filing date	"Y"	document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claims or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

08 August 2003 (08.08.2003)

Date of mailing of the international search report

14 NOV 2003

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
Facsimile No. (703)305-3230

Authorized officer

Le. Thien Minh  
Telephone No. (703) 308-0956